ALBERT R. MANN LIBRARY
AT
CORNELL UNIVERSITY

CORNELL UNIVERSITY LIBRARY
3 1924 080 045 150

DATE DUE

GAYLORD
PRINTED IN U.S.A

QK
600
M992
v.64
1997

QK
600
M992
v.64
1997

MYCOTAXON

AN INTERNATIONAL JOURNAL FOR RESEARCH ON
TAXONOMY & NOMENCLATURE OF FUNGI, INCLUDING LICHENS

Volume LXIV September 1997

CONTENTS

Inocybe purpureoflavida sp. nov. (Corticiaceae) from Western Ghats of Kerala State, India.
K. B. Vrinda, C. K. Pradeep, Sibi Mathew, and T. K. Abraham 1
Some Costa Rican hyphomycetes. II ... **A. Mercado-Sierra, J. Gené, and J. Guarro** 7
The lichen genus *Pertusaria* (lichenised Ascomycotina) in Papua New Guinea and Australia: twelve new species and thirteen new reports.
John A. Elix, André Aptroot, and Alan W. Archer 17
Contribution to the lichen flora of Brazil. XXXII. *Pseudocyphellaria intricata* new to Brazil.
Héctor S. Osorio 37
Jumillera and *Whalleya*, new genera segregated from *Biscogniauxia*.
Jack D. Rogers, Yu-Ming Ju, and Felípe San Martín 39
Two new species of *Tranzschelia* (Uredinales) on Prunoideae (Rosaceae) from Iran.
M. Abbasi and Halvor B. Gjærum 51
Fulvisporium, a new genus of Ustilaginales...**K. Vánky, R. Bauer, and D. Begerow** 57
Changbai wood-rotting fungi 6. Study on *Antrodiella*, two new species and notes on some other species.............................. **Yu-Cheng Dai and Tuomo Niemelä** 67
Asteromidium tabebuiae-impetiginosae sp. nov. causing a leaf spot disease of *Tabebuia impetiginosa* in Brazil.
A. W. V. Pomella, R. W. Barreto, A. C. Alfenas, and J. B. Mesquita 83
A taxonomic summary of *Achlyogeton*......**Will H. Blackwell and Martha J. Powell** 91
The P. A. Saccardo Mycological Herbarium. A critical revision of the 1930's edition of the catalogue by G. Gola. I – Eubacteria, Dictyosteliomycota, Myxomycota, Plasmodiophoromycota..**Mario Orsenigo** 101
Gymnopus villosipes – a common collybioid agaric from California.
Dennis E. Desjardin, Roy E. Halling, and Brian A. Perry 141
Notes on some 'dimeriaceous' fungi.......................................**Margaret E. Barr** 149
Therrya eucalypti sp. nov. on stems of eucalypts from Tasmania, Australia.
Zi Qing Yuan and C. Mohammed 173
Endogonales in Taiwan: a new genus with unizygosporic sporocarps and a hyphal mantle.
Chi-Guang Wu and Suh-Jen Lin 179
Notes on conidial fungi. XV. *Monodictys bicolorata*, sp. nov.
R. F. Castañeda Ruíz, J. Guarro, and M. J. Figueras 189
Xylaria pseudoapiculata and *Xylaria montagnei*: two new taxa from south Brazil.
Maria Sirlei Hamme and Rosa Trinidad Guerrero 195
Tropical hyphomycetes of Mexico. II. Some species from the tropical biology station "Los Tuxtlas," Veracruz, Mexico............................**Gabriela Heredia Abarca, Julio Mena Portales, Angel Mercado Sierra, and Manuela Reyes Estebanez** 203
Bulbothricella amazonensis is a polysporous member of *Bulbothrix* (Parmeliaceae).
H. Thorsten Lumbsch 225
Corticioid species (Basidiomycotina, Aphyllophorales) from Colombia collected by Leif Ryvarden....................................**Kurt Hjortstam and Leif Ryvarden** 229

[Contents continued inside front cover]

ISSN 0093-4666 MYXNAE 64: 1-500 (1997)

For subscription details, availability in microfilm and microfiche, and availability of articles as tear sheets, see back cover.

[Contents continued from front cover]

Macrofungus flora of the Lagoon of Venice and adjacent areas (Italy). Non-gilled basidiomycetes. I. Tomentelloid fungi........................ **Cristiano Losi** 243
Macromycetes from the State of Paraná, Brazil. 6. Sirobasidiaceae & Tremellaceae. **Peter Roberts and André A. R. de Meijer** 261
Non-pileate polypores on Santa Catarina Island, SC, Brazil. **Clarice Loguercio Leite and Alexandra Lehmkuhl Gerber** 285
The Ustomycota: an inventory.................... **Robert Bauer and Franz Oberwinkler** 303
Contributions towards a monograph of *Phoma* (Coelomycetes)–V. Subdivision of the genus in sections.. **G. H. Boerema** 321
Notes on conidial fungi VI. *Menisporopsis*. **R. F. Castañeda Ruíz, J. Cano, and J. Guarro** 335
A new species and a synonymy in *Echinostelium* (Myxomycetes)........ **Francisco Pando** 343
Oligoporus rennyi in North America.................. **R. L. Gilbertson and Sam Ristich** 349
Notes on *Wolfiporia dilatohypha* in North America. **Robert L. Gilbertson and Donna M. Bigelow** 353
Two new combinations: *Amylofungus globosporus* and *Gloeomyces moniliformis*. **Sheng-Hua Wu** 361
Sympodioplanus, a new anamorph genus from South America. **R. C. Sinclair, Sanette Boshoff, and A. Eicker** 365
Fungi of Barro Colorado Island, adjacent Panama, and the Cali region of Colombia. **R. D. Goos** 375
Metatrichia horrida (Myxomycetes), and African species in the Baja California Peninsula (Mexico) .... **G. Moreno, M. Lizárraga, and C. Illana** 385
Confirmation of the presence of *Dictyocephalos attenuatus* (Gasteromycetes) in Europe. **G. Moreno, A. Altés, and H. Kreisel** 393
Podoscypha warneckeana.. **Leif Ryvarden** 401
Cercosporoid fungi from Brazil. 1. **Pedro W. Crous, Acelino C. Alfenas, and Robert W. Barreto** 405
NATS truffle and truffle-like fungi 6: *Stephensia bynumii* sp. nov. (Ascomycota), with a key to the species of *Stephensia*. **James M. Trappe, Welles Bushnell, and Michael A. Castellano** 431
NATS truffle and truffle-like fungi 7: *Tuber anniae* sp. nov. (Ascomycota). **Wes Colgan III and James M. Trappe** 437
First report of *Gastrosporium simplex* (Gasteromycetes) from South America. **Laura S. Domínguez de Toledo and Michael A. Castellano** 443
Notes of Sclerotiniaceous fungi on *Castanea* and *Castanopsis* in Asia. **Wen-ying Zhuang and Zheng Wang** 449
BCCM™/Allev 2.00 an automated system for the identification of yeasts. **Vincent Robert, Pierre Evrard, and Grégoire L. Hennebert** 455
Mycosphaerella pulmonariae sp. nov. from Bulgaria.................... **Violeta I. Fakirova** 465
Description of *Calonectria rumohrae* sp. nov. (anamorph = *Cylindrocladium rumohrae* sp. nov.)........................ **N. E. El-Gholl, A. C. Alfenas, D. T. Junghans, T. S. Schubert, J. W. Miller, and R. M. Leahy** 467
Author Index.. 485
Errata.. 487
Index to Fungous and Lichen Taxa 488
Reviewers 500
Publication Date, Volume 63... 500
Journal Publication Statement... 500

VOLUME SIXTY-FOUR

1997

Page 205, line 13	for *Acrodyctis*	read ***Acrodictys***
Page 205, line 24	for *Acrodyctis*	read ***Acrodictys***
Page 206, line 6	for *Acrodyctis*	read ***Acrodictys***
Page 344, line 21	for *E. E. coelecephalum*	read *E. coelocephalum*
Page 344, line 40	*for* on were the	*read* on where the
Page 379, line 37	*for* Saccaardo	*read* Saccardo

MYCOTAXON

AN INTERNATIONAL JOURNAL OF RESEARCH ON TAXONOMY & NOMENCLATURE OF FUNGI, INCLUDING LICHENS

VOLUME LXIV, 1997

COMPLETE IN ONE VOLUME
CONSISTING OF iv + 500 PAGES INCLUDING FIGURES

ALBERT R. MANN
LIBRARY

OCT 0 6 1997

ITHACA, NY 14853

EDITOR-IN-CHIEF

Jean Boise Cargill
P. O. Box 391887
678 Massachusetts Ave., Suite 501
Cambridge, MA 02139-0019, USA

Pavel Lizoň
Assistant to the Editor-in-Chief
Plant Pathology Herbarium
Cornell University, Ithaca, NY 14853

ASSOCIATE EDITORS

E. H. C. McKenzie
Book Review Editor
Herbarium PDD
Manaaki Whenua-Landcare Research
Private Bag 92170, Auckland, New Zealand

Grégoire L. Hennebert
French Language Editor
32 Rue de l'Elevage
B-1340 Ottignies -LLN, Belgium

Karen D. Gettelman
Index Editor
St. Louis, MO, USA

EDITORIAL ADVISORY BOARD

JACK D. ROGERS, Pullman, Washington, USA (1990-98,*Chm.*)
JAMES W. KIMBROUGH, Gainesville, Florida, USA (1990-97)
OVE ERIKSSON, Umeå, Sweden (1990-99)
RONALD H. PETERSEN, Knoxville, Tennessee, USA (1990-2000)
GARY J. SAMUELS, Beltsville, Maryland, USA (1997-2000)
DONALD H. PFISTER, Cambridge, Massachusetts, USA (1997-2001)

Published by
MYCOTAXON, LTD.P.O.BOX 264
ITHACA, NY 14851-0264, USA

www.mycotaxon.com

Printed in the United States of America

© Mycotaxon, Ltd., 1997

TABLE OF CONTENTS, VOLUME SIXTY-FOUR

September 1997

Inocybe purpureoflavida sp. nov. (Corticiaceae) from Western Ghats of Kerala State, India.
K. B. Vrinda, C. K. Pradeep, Sibi Mathew, and T. K. Abraham 1
Some Costa Rican hyphomycetes. II .... **A. Mercado-Sierra, J. Gené, and J. Guarro** 7
The lichen genus *Pertusaria* (lichenised Ascomycotina) in Papua New Guinea and Australia: twelve new species and thirteen new reports.
John A. Elix, André Aptroot, and Alan W. Archer 17
Contribution to the lichen flora of Brazil. XXXII. *Pseudocyphellaria intricata* new to Brazil.
Héctor S. Osorio 37
Jumillera and *Whalleya*, new genera segregated from *Biscogniauxia*.
Jack D. Rogers, Yu-Ming Ju, and Felípe San Martín 39
Two new species of *Tranzschelia* (Uredinales) on Prunoideae (Rosaceae) from Iran.
M. Abbasi and Halvor B. Gjærum 51
Fulvisporium, a new genus of Ustilaginales....**K. Vánky, R. Bauer, and D. Begerow** 57
Changbai wood-rotting fungi 6. Study on *Antrodiella*, two new species and notes on some other species .... **Yu-Cheng Dai and Tuomo Niemelä** 67
Asteromidium tabebuiae-impetiginosae sp. nov. causing a leaf spot disease of *Tabebuia impetiginosa* in Brazil.
A. W. V. Pomella, R. W. Barreto, A. C. Alfenas, and J. B. Mesquita 83
A taxonomic summary of *Achlyogeton*.......**Will H. Blackwell and Martha J. Powell** 91
The P. A. Saccardo Mycological Herbarium. A critical revision of the 1930's edition of the catalogue by G. Gola. I – Eubacteria, Dictyosteliomycota, Myxomycota, Plasmodiophoromycota..**Mario Orsenigo** 101
Gymnopus villosipes – a common collybioid agaric from California.
Dennis E. Desjardin, Roy E. Halling, and Brian A. Perry 141
Notes on some 'dimeriaceous' fungi..**Margaret E. Barr** 149
Therrya eucalypti sp. nov. on stems of eucalypts from Tasmania, Australia.
Zi Qing Yuan and C. Mohammed 173
Endogonales in Taiwan: a new genus with unizygosporic sporocarps and a hyphal mantle.
Chi-Guang Wu and Suh-Jen Lin 179
Notes on conidial fungi. XV. *Monodictys bicolorata*, sp. nov.
R. F. Castañeda Ruíz, J. Guarro, and M. J. Figueras 189
Xylaria pseudoapiculata and *Xylaria montagnei*: two new taxa from south Brazil.
Maria Sirlei Hamme and Rosa Trinidad Guerrero 195
Tropical hyphomycetes of Mexico. II. Some species from the tropical biology station "Los Tuxtlas," Veracruz, Mexico ....**Gabriela Heredia Abarca, Julio Mena Portales, Angel Mercado Sierra, and Manuela Reyes Estebanez** 203
Bulbothricella amazonensis is a polysporous member of *Bulbothrix* (Parmeliaceae).
H. Thorsten Lumbsch 225
Corticioid species (Basidiomycotina, Aphyllophorales) from Colombia collected by Leif Ryvarden.......................................**Kurt Hjortstam and Leif Ryvarden** 229
Macrofungus flora of the Lagoon of Venice and adjacent areas (Italy). Non-gilled basidiomycetes. I. Tomentelloid fungi .... **Cristiano Losi** 243
Macromycetes from the State of Paraná, Brazil. 6. Sirobasidiaceae & Tremellaceae.
Peter Roberts and André A. R. de Meijer 261
Non-pileate polypores on Santa Catarina Island, SC, Brazil.
Clarice Loguercio Leite and Alexandra Lehmkuhl Gerber 285
The Ustomycota: an inventory..................... **Robert Bauer and Franz Oberwinkler** 303
Contributions towards a monograph of *Phoma* (Coelomycetes)–V. Subdivision of the genus in sections ....**G. H. Boerema** 321
Notes on conidial fungi VI. *Menisporopsis*.
......................................**R. F. Castañeda Ruíz, J. Cano, and J. Guarro** 335
A new species and a synonymy in *Echinostelium* (Myxomycetes).........**Francisco Pando** 343
Oligoporus rennyi in North America...................**R. L. Gilbertson and Sam Ristich** 349

Notes on *Wolfiporia dilatohypha* in North America.
Robert L. Gilbertson and Donna M. Bigelow 353
Two new combinations: *Amylofungus globosporus* and *Gloeomyces moniliformis*.
Sheng-Hua Wu 361
Sympodioplanus, a new anamorph genus from South America.
R. C. Sinclair, Sanette Boshoff, and A. Eicker 365
Fungi of Barro Colorado Island, adjacent Panama, and the Cali region of Colombia.
R. D. Goos 375
Metatrichiahorrida (Myxomycetes), and African species in the Baja California Peninsula (Mexico)..**G. Moreno, M. Lizárraga, and C. Illana** 385
Confirmation of the presence of *Dictyocephalos attenuatus* (Gasteromycetes) in Europe.
G. Moreno, A. Altés, and H. Kreisel 393
Podoscypha warneckeana.. **Leif Ryvarden** 401
Cercosporoid fungi from Brazil. 1.
Pedro W. Crous, Acelino C. Alfenas, and Robert W. Barreto 405
NATS truffle and truffle-like fungi 6: *Stephensia bynumii* sp. nov. (Ascomycota), with a key to the species of *Stephensia*.
James M. Trappe, Welles Bushnell, and Michael A. Castellano 431
NATS truffle and truffle-like fungi 7: *Tuber anniae* sp. nov. (Ascomycota).
Wes Colgan III and James M. Trappe 437
First report of *Gastrosporium simplex* (Gasteromycetes) from South America.
Laura S. Domínguez de Toledo and Michael A. Castellano 443
Notes of Sclerotiniaceous fungi on *Castanea* and *Castanopsis* in Asia.
Wen-ying Zhuang and Zheng Wang 449
BCCM™/Allev 2.00 an automated system for the identification of yeasts.
Vincent Robert, Pierre Evrard, and Grégoire L. Hennebert 455
Mycosphaerellapulmonariae sp. nov. from Bulgaria.....................**Violeta I. Fakirova** 465
Description of *Calonectriarumohrae* sp. nov. (anamorph = *Cylindrocladium rumohrae* sp. nov.).........................**N. E. El-Gholl, A. C. Alfenas, D. T. Junghans, T. S. Schubert, J. W. Miller, and R. M. Leahy** 467
Author Index.. 485
Errata.. 487
Index to Fungous and Lichen Taxa 488
Reviewers.. 500
Publication Date, Volume 63.. 500
Journal Publication Statement.. 500

MYCOTAXON

Volume LXIV, pp. 1-6 September 1997

INOCYBE PURPUREOFLAVIDA SP. NOV. (CORTINARIACEAE) FROM WESTERN GHATS OF KERALA STATE, INDIA.

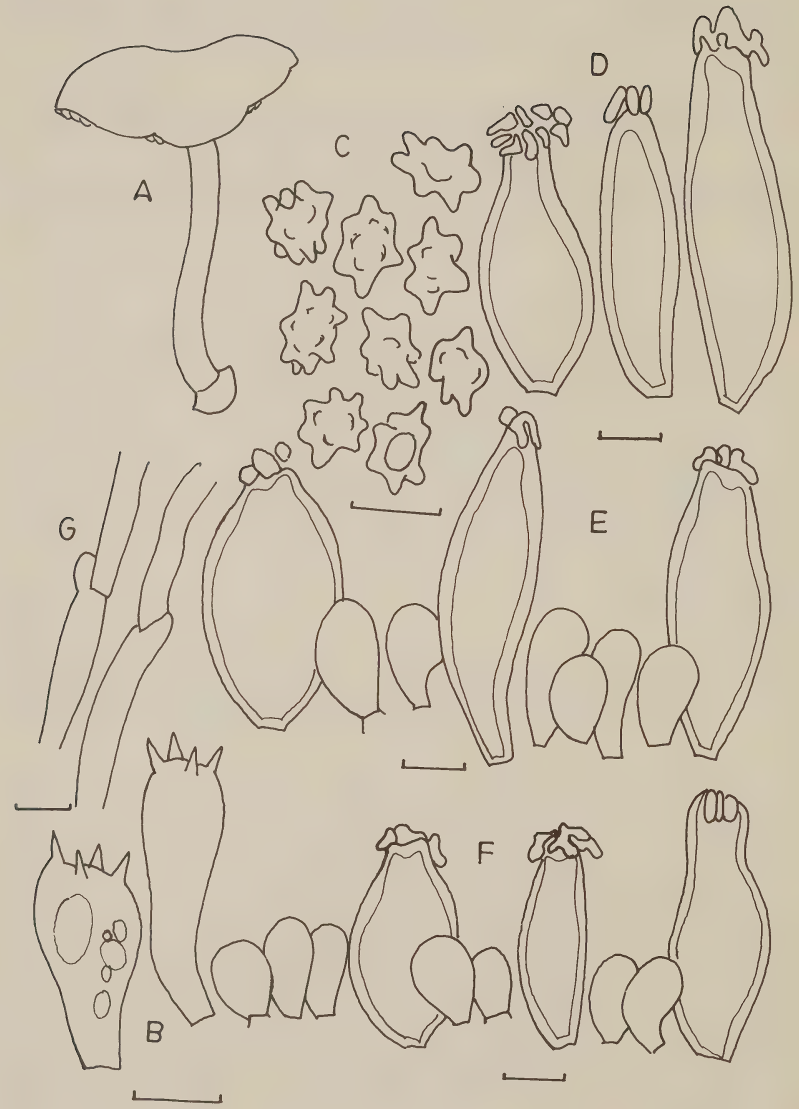
K.B.VRINDA, C.K.PRADEEP, SIBI MATHEW
AND T.K.ABRAHAM

Tropical Botanic Garden & Research Institute, Palode,
Thiruvananthapuram - 695 562, Kerala, India.

ABSTRACT

Inocybe purpureoflavida sp. nov. is described as new, based on collections from Kerala, south India.

In our studies on agaric flora of Western Ghats of Kerala, an interesting species of *Inocybe* (Fr.) Fr., was collected. A subsequent literature review of the species in *Inocybe* revealed that this fungus has not been previously described. It is therefore described as new. Observations are based on fresh specimens collected by the authors. Microscopic characters were studied from freehand sections mounted in 3% KOH. Colour terminology used is that of Kornerup & Wanscher (1967). The specimens are deposited in the Mycological Herbarium of the Microbiology Division,


A
B
C
D
E
F
G

TBGRI, Kerala and part at the Royal Botanic Gardens, Kew.

Inocybe purpureoflavida Vrinda & Pradeep, sp. nov. (Fig.1, A-G)

Etymology: purpureus (L.), purple; flavidus (L.), pale yellow

Pileus 3.5-6.5 cm latus, carnosus, plano-convexus vel applanatus, atropurpureus, radialiter fibrillosus ad marginem rimosus. Lamellae adnatae vel, griseo-brunneus, ventricosae, confertae cum duabus vel tribus ordinibus lamellularum intermixtae. Stipes 3.5-7 cm x 5-10 mm, cylindricus, ad basim marginatum bulbosus, solidus. Caro albida, immutabilis. Sporae 9-10.5 x 7.5-9 µm, ovoideae vel ellipsoideae, brunneae, 9-12 nodulatae. Basidia 25.5-42 x 9-12 µm, clavata, 4-sporigera. Cystidia ventrico-fusiformia vel lageniformia, hyalina, crassitunicata, cristata. Trama hymenophoralis regularis, hylina. Cuticula pileo ex hyphis repentibus 4.5-12 µm latis composita. Caulocystidia ad apiceus stipitis, cystidiis hymenialibus similia.

Pileus 3.5-6.5 cm diam., fleshy, convex to plano-convex, soon applanate, finally depressed; surface `dark purple'

Fig.1, A-G. *Inocybe purpureoflavida.* A habit x ½;
B. basidia; C. spores; D. pleurocystidia; E. cheilocystidia;
F. caulocystidia; G. cuticular hyphae.
Scale bar = 10 µm

(14F6 -14F8) at first, remaining so or becoming pallid, glutinous when wet, becoming silky shiny when dry, unbroken at centre, finely rimose at the margin. Lamellae adnate, `brownish grey' (6C2), turning `leather brown' (6E6) when bruised, up to 4 mm wide, crowded, with lamellulae of 2-3 lengths; edge concolorous. Stipe 3.5-7 cm x 5-10 mm, central, cylindric, solid, equal with a small but distinct marginate bulb at the base; surface `yellowish white' (2A2) to `ivory' (4B3), without any purplish tints except at the marginal bulb which is concolorous with the pileus, smooth and non -viscid. Odour peculiar, of radish when fresh, fishy when old. Context whitish, up to 5 mm wide, soft, unchanging, of inflated, thin-walled hyphae, 3-27μm diam., with clamp-connexions. Spores (including nodules) 9-10.5 x 7.5-9 μm, subglobose to ellipsoid, brown, bearing 9-12 prominent nodules. Basidia 25.5-42 x 9-12 μm, clavate, bearing four sterigmata. Pleurocystidia scattered, 39-66 x 12-21 μm, ventricose-fusoid to lageniform, bearing crystalloid deposites at apex, thick-walled, hyaline. Edge of lamellae with dense clusters of thin-walled, clavate to pyriform cheilocystidia, 15-21 x 7.5-15 μm, intermixed with metuloids similar to pleurocystidia. Hymenophoral trama regular, hyaline, with inflated hyphae, 3-15μm diam. Subhymenial layer pseudoparenchymatous. Pileipellis a repent epicutis of radially arranged thin-walled, hyaline hyphae, 4.5-12 μm diam. Stipe with abundant caulocystidia, 13.5-22 x 7.5-16.5 μm and metuloids like the pleurocystidia, dense at the apex, scattered elsewhere.

On ground, along river side, scattered, probably in association with *Hopea parviflora* Bedd. (Dipterocarpaceae).

Specimens examined: India, Kerala, TBGRI campus : 12 July 1996, TBGRI 3388 (Holotype), K(M) 39262 (Isotype); 15 April 1996, TBGRI 2851, K(M) 39132.

This highly distinctive of *Inocybe* (Fr.) Fr. Section *Marginatae* Kühner, with a purplish tinted pileus, is closely related to another south-east Asian species, *Astrosporina corneri* Horak, described from Sabah (Horak, 1979). The spores offer the best means of seperation, being larger and with far more prominent nodules in *I. purpureoflavida*, whilst the spores of *A.corneri* measure only 7-8 x 5.5-6 µm. *Inocybe purpureoflavida* is further separated by the macrofeatures, particularly the non-umbonate pileus and the bulbous stipe base. It remains to be seen whether the purplish tint on an otherwise pale yellow stipe is variable in either species.

ACKNOWLEDGEMENTS

The authors are grateful to the WGDP of the Department of Planning and Economic Affairs, Government of Kerala for the financial assistance and to Dr. P.Pushpangadan, Director, TBGRI, for the encouragement and facilities for carrying out this work.

We are indebted to Dr. D.N.Pegler, Royal Botanic Gardens, Kew, England, for his valuable help in the identification of the specimen and review of the manuscript. One of us (CKP) acknowledges financial assistance from CSIR, New Delhi.

REFERENCES

Horak, E. (1979). *Astrosporina* in Indomalaya and Australia. *Persoonia* 10:157-205.

Kornerup, A & J.H. Wanscher. (1967). *Methuen Handbook of Colour*. Methuen & Co., London, 243 p.

MYCOTAXON

Volume LXIV, pp. 7-15 September 1997

SOME COSTA RICAN HYPHOMYCETES. II.

A. Mercado-Sierra[1], J. Gené[2] and J. Guarro[2]

[1]Instituto de Ecología y Sistemática, Academia de Ciencias de Cuba, A.P. 8010, Ciudad de la Habana 10800, Cuba. [2]Unitat de Microbiologia, Facultat de Medicina i Ciències de la Salut, Universitat Rovira i Virgili, 43201-Reus, Spain.

ABSTRACT

Piricauda longispora *sp. nov.* is described and illustrated from plant debris in Costa Rica. Many other species of hyphomycetes, which constitute new records for the mycobiota of that country, are also reported. All these species were collected in the Guanacaste Conservation Area.

Key words: ***Piricauda longispora*** *sp. nov.*, hyphomycetes, Costa Rica.

RESUMEN

Se describe e ilustra ***Piricauda longispora*** *sp. nov.* de restos vegetales recolectados en Costa Rica. También se incluyen otras especies de hifomicetes, las cuales constituyen nuevas citas para la micobiota de dicho país. Todas las especies fueron recolectadas en "Guanacaste Conservation Area".

Palabras clave: ***Piricauda longispora*** *sp. nov.*, hifomicetes, Costa Rica.

The present work was carried out in the Guanacaste Conservation Area (GCA), where the senior author collected fungi during the Fungus Taxonomic Working Group (TWIG) workshop for the All Taxa Biodiversity Inventory (ATBI) Project supported by the Costa Rican National Biodiversity Institute (INBIO). The GCA in northwest Costa Rica occupying 110,000 Ha, between 400 and 2,000 m altitude, contains representatives of the three major tropical ecosystems: dry forest, cloud forest and rainforest, and numerous other habitats. The samples were collected from June 11 to 15 of 1995 at the three principal biological stations of the GCA, namely: Santa Rosa Biological Station (dry forest), Pitilla Biological Station (rainforest) and Cacao Biological Station (cloud forest).

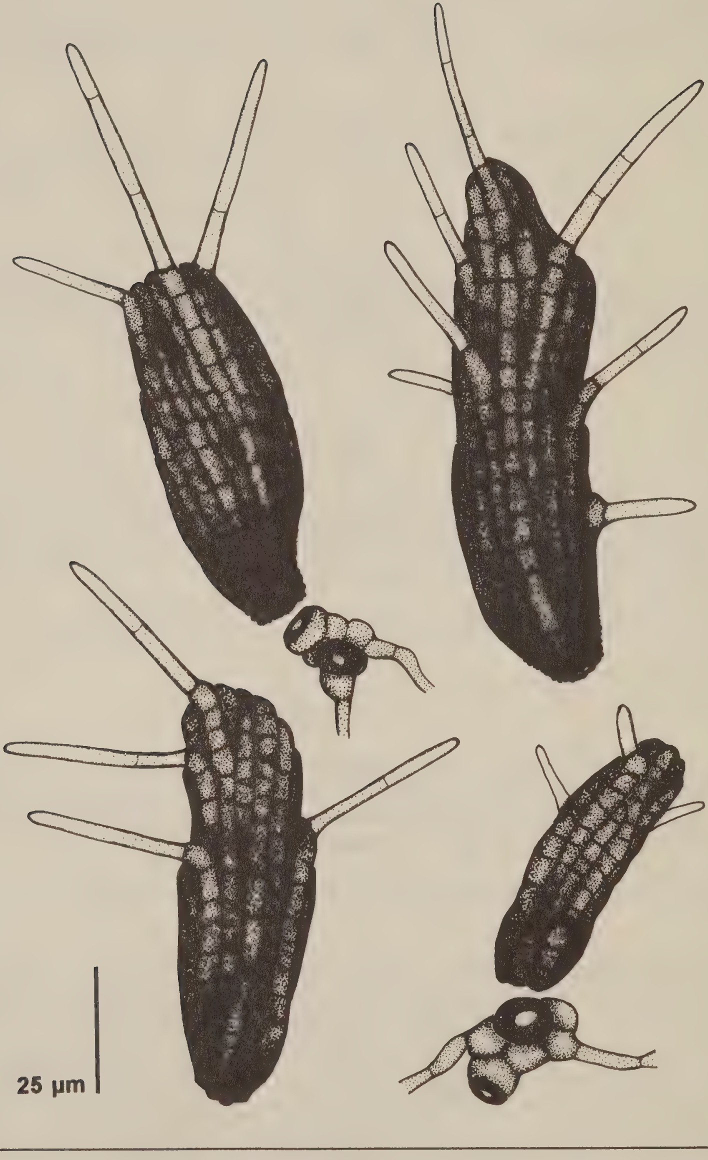


Fig. 1. ***Piricauda longispora***, HACM 9141. Conidiogenous cells and conidia.

The hyphomycete flora of this country is at present poorly known. The most relevant contributions are those of Goos (1960), Morris (1972) and more recently those of Bills & Polishook (1994) and Mercado-Sierra *et al.* (1996). In the present work we list 22 species from the GCA. One species of ***Piricauda*** Bubak is proposed as new. The remaining 21 species constitute new records for the Costa Rican mycobiota. The types and specimens of the material referred to are deposited in the Cuban Mycological Herbarium (HACM), but in the near future they will be moved to the facilities of the INBIO in Costa Rica. This is only a preliminary contribution to the knowledge and inventory of the GCA mycobiota and more extensive works will be published within the ATBI Project.

Piricauda longispora Mercado-Sierra, Gené & Guarro, *sp. nov.* Figs 1-4

Coloniae effusae, nigrae. Mycelium superficiale e hyphis laevibus, pallide brunneis, ramosis et anastomosantibus, 2-3 μm crassis compositum. Conidiophora micronematosa, anastomosantia, flexuosa, 4-7 μm crassa. Cellulae conidiogenae monotreticae, in conidiophoris incorporatae, clavatae vel unciformes, cicatricatae. Conidia solitaria, cylindrica, fusiformia vel oblonga, plerumque irregulariter lobulata, atrobrunnea, muriformia, laevia vel leviter verrucosa ad basim, 37-140 (85-100) x 21-39 (25-30) μm, plerumque cum 4-11 brevis appendicis, dilute brunneis, septatis, 10-60 (20-30) x 3-5.5 μm.

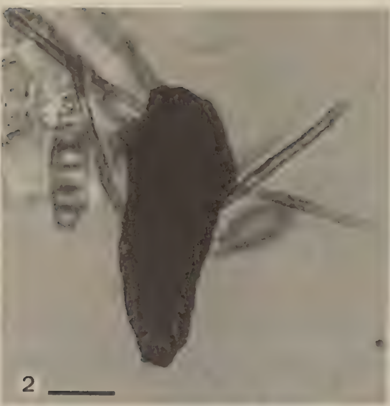
Colonies effuse, black. Mycelium superficial composed of smooth-walled, pale brown, branched, anastomosing, 2-3 *μm* wide hyphae. Conidiophores micronematous, anastomosing, flexuous, 4-7 *μm* thick. Conidiogenous cells monotretic, integrated, clavate or hook-shaped, cicatrized. Conidia solitary, cylindrical, fusiform or oblong, with rounded ends, frequenty irregularly lobed, dark brown to blackish brown, muriform, smooth-walled or minutely rugose at the base, 37-140 (85-100) x 21-39 (25-30) *μm*, frequently with 4-11, mostly short, septate, pale brown appendages, 10-60 (20-30) x 3-5.5 *μm*.

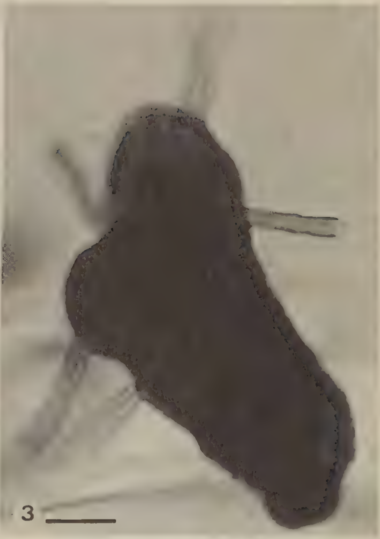
Holotype: HACM 9141, on dead petioles of an undetermined palm tree, Costa Rica, Guanacaste Province, Cacao Biological Station, coll. A. Mercado-Sierra, 15 June 1995.

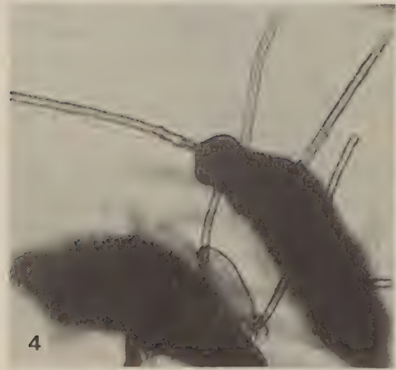
P. longispora is related to ***P. cochinensis*** (Subram.) M.B. Ellis, a common fungus in tropical and subtropical India (Ellis 1976) and Cuba (Holubová-Jechová & Mercado-Sierra 1986, 1989), but differs in shape, colour and considerably greater size of the conidia. Conidia of ***P. cochinensis*** are pyriform to obconical, brown to dark brown, 25-70 x 15-46 *μm*, with numerous septate appendages up to 90 *μm* long. In addition, they are distinctly verrucose at the base, while the conidia of ***P. longispora*** are smooth or only minutely rugose.

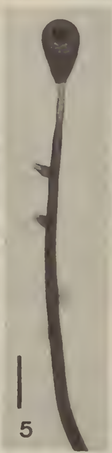
Conidial fungi first recorded for Costa Rica

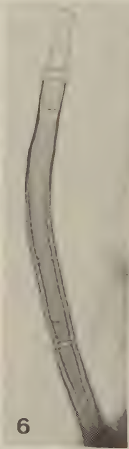
Brachysporiella gayana Bat., *Bol. Secr. Agr. Ind. Com. Est. Pernambuco* **19**: 109, 1952. Fig.5

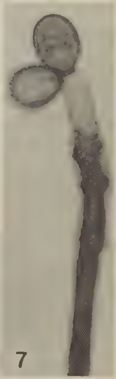

2

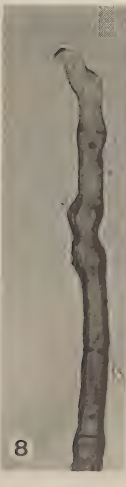

3

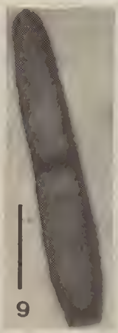

4

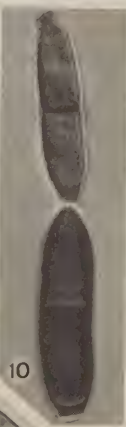

5

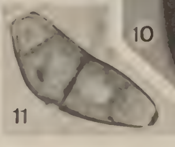

6

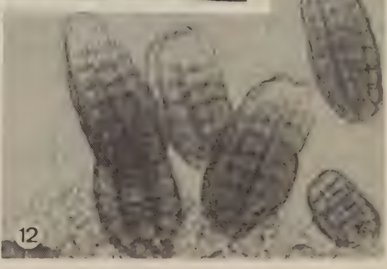

7


8


9


10


11


12

On a dead petiole of an undetermined palm tree and on dead branches of *Smilax* sp., Pitilla Biological Station, 13 June 1995, coll. A. Mercado-Sierra (HACM 9120).

Ceratosporella deviata Subram., *Proc. Indian Acad. Sci. Sect. B* **46**: 327, 1957.

On dead branches, Pitilla Biological Station, 13 June 1995, coll. A. Mercado-Sierra (HACM 9140).

Chalara brachyspora Sacc., *Michelia* **1**: 81, 1877. Fig. 6

On unidentified wood, Centeno River, near Santa Rosa, Santa Rosa Biological Station, 11 June 1995, coll. A. Mercado-Sierra (HACM 9121).

Cordana abramovii Seman & Davydkina, *Nov. Syst. Pl. non vasc.* **20**: 115, 1983. Fig. 7

On dead branches, Pitilla Biological Station, 13 June 1995, coll. A. Mercado-Sierra (HACM 9122).

This fungus was previously reported only in Asia on leaves of banana *Musa sapientum* (Ellis 1976). This is the first record for the Western Hemisphere.

Corynesporopsis isabelicae Hol.-Jech, *Ces. Mykol.* **41**: 109, 1987. Figs 9, 10

On rachides of an undetermined palm tree mixed with Melioleneae and microthyriaceous fungi, Pitilla Biological Station, 13 June 1995, coll. A. Mercado-Sierra (HACM 9142).

This species was originally described by Holubová-Jechová (1987) on a dead palm petiole from Cuba and more recently Matsushima (1993) found it also on the same substrate in Rio Negro, Peru.

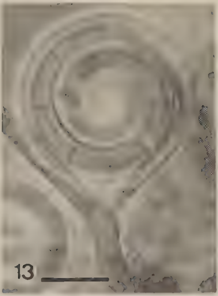
Curvularia pallescens Boedijn, *Bull. Jard. Bot. Buitenz. III* **13**: 126, 1933. Figs 8, 11

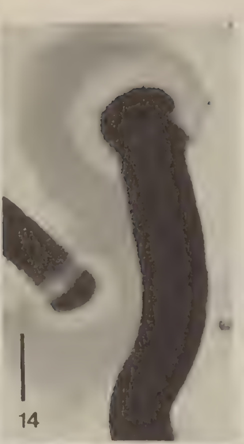
On dead culms of *Bambusa* sp., Naranjo Valley, Santa Rosa Biological Station, 12 June 1995, coll. A. Mercado-Sierra (HACM 9123).

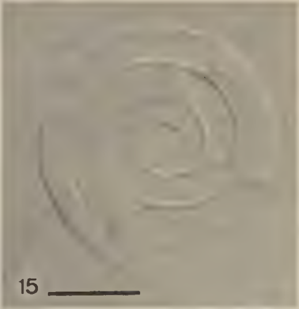
Dictyosporium subramanianii B. Sutton, *Proc. Indian Acad. Sci. (Plant Sci.)* **94**: 239, 1985. Fig. 12

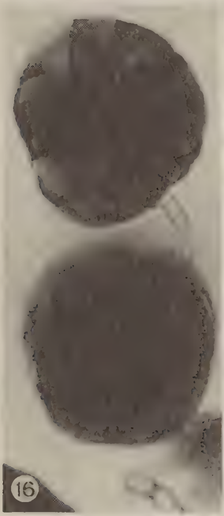
On dead stems of a Gramineae, Cacao Biological Station, 15 June 1995, coll. A. Mercado-Sierra (HACM 9124).

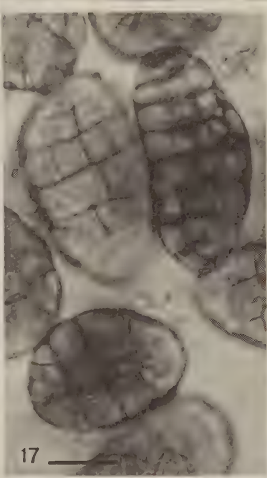
Figs 2-4. *Piricauda longispora*, HACM 9141; **Fig. 5. *Brachysporiella gayana***, HACM 9120; **Fig. 6. *Chalara brachyspora***, HACM 9121; **Fig. 7. *Cordana abramovii***, HACM 9122; **Figs 8, 11. *Curvularia pallescens***, HACM 9123; **Figs 9,10. *Corynesporopsis isabelicae***, HACM 9142; **Fig. 12. *Dictyosporium subramanianii***, HACM 9124. Figs 2, 4, 6, 7, 12 bar = 20 *μm*; Figs 3, 8, 11 bar = 10 *μm*; Fig. 5 bar = 40 *μm*; Figs 9, 10 bar = 10 *μm*.

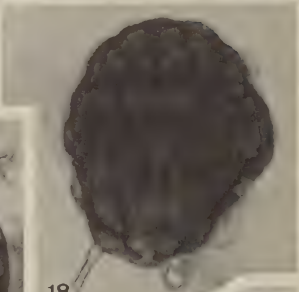

13

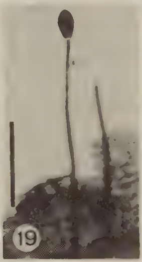

14

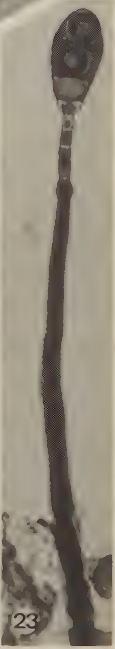

15

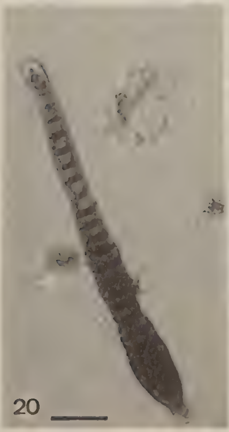

16

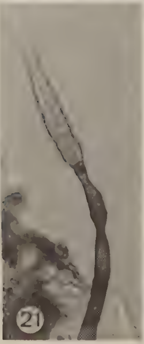

17

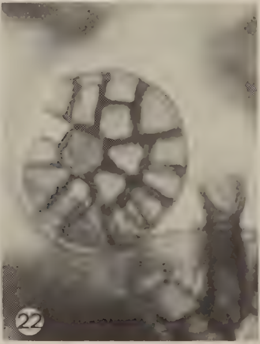

18


19


23


20


21


22

Drepanospora pannosa Berk. & Curtis, *Grevillea* **3**: 105, 1875. Fig. 13

On dead branches of an unidentified tree, Pitilla Biological Station, 13 June 1995, coll. A. Mercado-Sierra (HACM 9125).

The conidia of this specimen are pale brown and minutely echinulate. Known from rotten wood in USA, Tanzania and New Zealand; recently recorded from Cuba as **Helicosporium nematosporum** Linder (Mercado-Sierra 1982, 1984).

Gonytrichum chlamydosporum G.L. Barron & G.C. Bhatt var. **simile** W. Gams & Hol.-Jech., *Stud. Mycol.* **13**: 88, 1976.

On decayed wood, Cacao Biological Station, 15 June 1995, coll. A. Mercado-Sierra (HACM 9126).

Previously known from the former Czechoslovakia (Gams & Holubová-Jechová 1976).

Graphium calicioides (Fr.) R.C. Cooke & Massee, *Grevillea* **16**: 11, 1887. Fig. 14

On dead branches, Pitilla Biological Station, 13 June 1995, coll. A. Mercado-Sierra (HACM 9127).

This species is common on rotten wood in Europe but rare in tropical areas.

Helicomyces roseus Link, *Mag. Ges. naturf. Freunde, Berlin* **3**: 21, 1809.

On dead branches and dead wood, Pitilla Biological Station, 13 June 1995, coll. A. Mercado-Sierra (HACM 9128); Cacao Biological Station, 15 June 1995, coll. A. Mercado-Sierra (HACM 9129).

Helicosporium griseum Berk. & Curtis, *Grevillea* **3**: 51, 1874. Fig. 15

On dead branches, Pitilla Biological Station, 13 June 1995, coll. A. Mercado-Sierra (HACM 9130).

Helicosporium virescens (Pers.) Sivan., *Bitunicate Ascomycetes and their anamorphs*: 591, 1984.

On rotten log, Centeno River, near Santa Rosa, Santa Rosa Biological Station, 11

Fig. 13. ***Drepanospora pannosa***, HACM 9125; **Fig. 14.** ***Graphium calicioides***, HACM 9127; **Fig. 15.** ***Helicosporium griseum***, HACM 9130; **Fig. 16.** ***Hermatomyces sphaericum***, HACM 9132; **Fig. 17.** ***Monodictys paradoxa***, HACM 9134; **Fig. 18.** ***Monodictys putredinis***, HACM 9135; **Figs 19, 23.** ***Melanocephala triseptata***, HACM 9133; **Fig. 20.** ***Sporidesmium adscendens***, HACM 9136; **Fig. 21.** ***Sporidesmium leptosporum***, HACM 9137; **Fig. 22.** ***Xenosporium berkeleyi***, HACM 9138. Figs 13, 21, 23 bar = 20 *μm*; Figs 14, 19 bar = 100 *μm*; Figs 15, 16 bar = 10 *μm*; Figs 17, 18, 22 bar = 10 *μm*; Figs 20 bar = 20 *μm*.

June 1995, coll. A. Mercado-Sierra (HACM 9131).

Hermatomyces sphaericum (Sacc.) S.J. Hughes, *Mycol. Pap.* **50**: 100, 1953. Fig. 16

On dead branches, Pitilla Biological Station, 13 June 1995, coll. A. Mercado-Sierra (HACM 9132).

Melanocephala triseptata (Shearer, J.L. Crane & M.A. Mill.) S.J. Hughes, *New Zeal. J. Bot.* **17**: 171, 1979. Figs 19, 23

On dead rachides of an undetermined palm tree, Pitilla Biological Station, 13 June 1995, coll. A. Mercado-Sierra (HACM 9133).

Monodictys paradoxa (Corda) S.J. Hughes, *Can. J. Bot.* **36**: 786, 1958. Fig. 17

On rotten wood, Cacao Biological Station, 15 June 1995, coll. A. Mercado-Sierra (HACM 9134).

Monodicys putredinis (Wallr.) S.J. Hughes, *Can. J. Bot.* **36**: 785, 1958. Fig. 18

On a dead rachis of an undetermined palm tree, Santa Rosa Biological Station, 11 June 1995, coll. A. Mercado-Sierra (HACM 9135).

Sporidesmium adscendens Berk., *Ann. Nat. Hist.* **4**: 291, 1840. Fig. 20

On dead branches, Santa Rosa Biological Station, 11 June 1995, coll. A. Mercado-Sierra (HACM 9136).

Sporidesmium leptosporum (Sacc. & Roum.) S.J. Hughes, *Can. J. Bot.* **36**: 808, 1958. Fig. 21

On dead branches of *Smilax* sp., Naranjo Valley, Santa Rosa Biological Station, 12 June 1995, coll. A. Mercado-Sierra (HACM 9137).

Xenosporium berkeleyi (Curtis) Piroz., *Mycol. Pap.* **105**: 27, 1966. Fig. 22

On a dead herbaceous stem, Pitilla Biological Station, 13 June 1995, coll. A. Mercado-Sierra (HACM 9138).

Zygosporium oscheoides Mont., *Ann. Sci. Nat. Sér. 2*, **77**: 121, 1842.

On dead leaves of *Musa* sp. and on dead petioles of an unknown palm tree, Cacao Biological Station, 15 June 1995, coll. A. Mercado-Sierra (HACM 9138, 9139).

We gratefully acknowledge Dr. E. Descals from the "Institut d'Estudis Avançats" (U.I.B./C.S.I.C.) for serving as pre-submission reviewer.

REFERENCES

Bills, G.F. and J.D. Polishook. 1994. Abundance and diversity of microfungi in leaf litter of a lowland rainforest in Costa Rica. *Mycologia* **86**: 187-198.

Ellis, M.B. 1976. *More Dematiaceous Hyphomycetes*. Commonwealth Mycological Institute, Kew. 507 pp.

Gams, W. and V. Holubová-Jechová. 1976. ***Chloridium*** and some other dematiaceous hyphomycetes growing on decaying wood. *Studies in Mycology* **13**: 1-99.

Goos, R.D. 1960. Soil fungi from Costa Rica and Panama. *Mycologia* **52**: 877-883.

Holubová-Jechová, V. 1987. Studies on Hyphomycetes from Cuba VI. New and rare species with tretic and phialidic conidiogenous cells. *Ceska Mykologie* **41**: 107-114.

Holubová-Jechová, V. and A. Mercado-Sierra. 1986. Studies on hyphomycetes from Cuba. IV. Dematiaceous hyphomycetes from the Province Pinar del Río. *Ceska Mykologie* **40**: 142-164.

Holubová-Jechová, V. and A. Mercado-Sierra. 1989. Hyphomycetes from Loma de la Coca and some localities of La Habana and Matanzas Provinces, Cuba. *Acta Botánica Cubana* **76**: 1-15.

Matsushima, T. 1993. *Matsushima Mycological Memoris* **7**: 1-75.

Mercado-Sierra, A. 1982. Taxonomía y aspectos ecológicos de algunos hifomicetes helicospóricos hallados en Cuba. *Acta Botanica Cubana* **11**: 1-11.

Mercado-Sierra, A. 1984. *Hifomicetes demaciáceos de Sierra del Rosario, Cuba*. Academia, La Habana. 181 pp.

Mercado-Sierra, A., J. Gené and J. Guarro. 1996. Some Costa Rican hyphomycetes. I. *Nova Hedwigia* (in press).

Morris, E.F. 1972. Costa Rican Hyphomycetes. *Mycologia* **64**: 887-896.

MYCOTAXON

Volume LXIV, pp. 17-35 September 1997

THE LICHEN GENUS PERTUSARIA (LICHENISED ASCOMYCOTINA) IN PAPUA NEW GUINEA AND AUSTRALIA: TWELVE NEW SPECIES AND THIRTEEN NEW REPORTS

JOHN A. ELIX

Department of Chemistry, The Faculties, Australian National
University, Canberra, A.C.T. 0200, Australia

ANDRE APTROOT

Centraalbureau voor Schimmelcultres
P.O. Box 273, 3740 AG Baarn,
The Netherlands

ALAN W. ARCHER

National Herbarium of New South Wales,
Royal Botanic Gardens, Sydney, N.S.W. 2000, Australia

ABSTRACT: *Pertusaria asterella* Aptroot, *P. burburana* Elix & A.W. Archer, *P. gongylospora* Elix & A.W. Archer, *P. gorokorana* Elix & A.W. Archer, *P. kagamugana* Elix & A.W. Archer, *P. streimannii* Elix & A.W. Archer, *P. subsorodes* Elix & A.W. Archer, *P. wauensis* Elix & A.W. Archer and *P. weberi* Elix & A.W. Archer are reported as new species from Papua New Guinea, and *P. consanguinea* Müll.Arg., *P. copelandii* Vainio, *P. elliptica* Müll.Arg., *P. hermaka* A.W. Archer, *P. howeana* A.W. Archer & Elix, *P. philippina* Vainio, *P. pseudococcodes* Müll.Arg., *P. psoromica* A.W. Archer & Elix, *P. puffina* A.W. Archer & Elix, *P. pycnothelia* Nyl., *P. ramulifera* H. Magn., *P. subplanaica* A.W. Archer & Elix and *P. vulpina* A.W. Archer are reported for the first time from the same region. *Pertusaria leioplaca* Schaer. var. *dispora* Müll.Arg, is reported as a new synonym of *P. pycnothelia* Nyl. *Pertusaria amnicola* Elix & A.W. Archer, *P. coniophora* Elix & A.W. Archer and *P. doradorensis* Elix & A.W. Archer are reported as new species from Australia (Lord Howe Island, Victoria and New South Wales, respectively).

INTRODUCTION: The lichen genus *Pertusaria* in Papua New Guinea was recently revised and new taxa and a key to the species were reported (Archer, Elix & Streimann 1995). This paper describes nine new species and reports an additional thirteen taxa from Papua New Guinea for the first time.

The new species are based mainly on material collected by W. A. Weber and D. McVean in 1968, by H. Streimann during 1981 and 1982 and on additional material collected by A. Aptroot, P. Diederich and H. Sipman. The new species from Lord Howe Island is based on material collected by H. Streimann in 1995. The chemistry of the specimens was determined by thin layer chromatography (Elix & Ernst-Russell 1993) and liquid chromatography (Feige *et al.* 1993).

NEW SPECIES

Pertusaria amnicola Elix & A.W. Archer, sp. nov. Fig.1

Thallus albido-olivaceus, corticola, superficies laevis, subrimosus, isidiis et sorediis destituta; apothecia disciformia, numerosa, dispersa, subimmersa vel adnata, 0.5-0.8 mm diam.; disci nigri, albo-pruinosi, marginibus saepe involutis et laceris; ascosporae 2nae, ellipsoideae, (70-)80-98 µm longae, (21-)25-35 µm latae, parietibus 3-4 µm crassis.
Thallus acidum norsticticum continens.

Type: AUSTRALIA. New South Wales: Lord Howe Island, track to Mt. Gower, Erskine Creek Crossing, 31°34′42″S, 159°04′43″S, alt. 185 m, on semi-shaded palm stem by side of rocky stream, *H. Streimann 56033*, 11.ii.1995; CANB-holotype.

Thallus pale greenish-white, smooth, slightly cracked, corticolous, lacking isidia and soredia; *apothecia* disciform, numerous, scattered, slightly immersed or adnate on the thallus, 0.5-0.8 mm diam.; *disc* black, white pruinose, margin of discs sometimes inrolled and torn; *ascospores* 2 per ascus, ellipsoid, thin-walled, (70-)80-98 µm long, (21-)25-35 µm wide, the spore wall 3-4 µm thick.

Chemistry: K+ weak red, KC-, C-, Pd+ weak yellow; norstictic acid, in low concentration.

Specimen examined:
AUSTRALIA. New South Wales: Lord Howe island, type locality, *H. Streimann 56035* (CANB).

Pertusaria amnicola is characterised by disciform apothecia, asci with two ascospores and the presence of norstictic acid. Corticolous species with two-spored asci are uncommon in subgenus *Monomurata* (Archer 1993) and few taxa of this type are known.
The epithet "amnicola", "growing by the side of a stream" refers to the type location. The species is so far known only from two specimens from the type locality.

Pertusaria asterella Aptroot, sp. nov.

Pertusaria ad sectionem *Monomuratae* pertinens, thallo rimoso, pallide ochraceo, medulla alba, hypothallo albido circumcincto, lichexanthonum continente; ascomata apothecia, nigra, cinereopruinosa, marginibus coronatis; ascis monosporis; ascosporis 100-150 µm longae, 50-65 µm latae.

Type: PAPUA NEW GUINEA. Simbu Province: Mount Wilhelm, Pindaunde Valley, near the hut on the south shore of Lake Piunde, 145°03′E, 5°47′E, alt. ca. 3600 m; subalpine forest remnants on west slope of valley; *A. Aptroot 18613*, 5-8.viii.1992; B-holotype; ABL-isotype.

Thallus continuous, rimose, pale yellowish grey, corticolous, with white medulla, surounded by a whitish hypothallus; *ascomata* apothecia, sessile, 1-2 mm diam., constricted, disc black but greyish due to white pruina, margin bending outwards, crenulate, white, partly disintegrating and becoming coronate; epihymenium granular; *ascospores* 1 per ascus, thick-walled, smooth, 100-150 µm long, 50-65 µm wide.

Chemistry: K-, KC-, C-, Pd-; lichexanthone only.

Specimens examined:
PAPUA NEW GUINEA. Simbu Province: Mount Wilhelm, Pindaunde Valley, type location, *A. Aptroot 31397, 32735* (herb. Aptroot); *ibid., H. Sipman 22072, 22081, 22093, 35644* (B).

The species is distinguished from other species in section *Monomuratae* by the coronate margin around the black discs, and by the chemistry. It is a conspicuous element in the Mount Wilhelm lichen flora.

Pertusaria buburana Elix & A.W. Archer, sp. nov.

Thallus pallido-olivaceus, tenuis, corticola, superficies laevis et nitida, sorediis destituta, isidiatus; isidia numerosa, brevia, simplicia, laevia, 0.2-0.3 mm alta, 0.1 mm diam.; apothecia ignota.
Thallus acidum 2′-*O*-methylperlatolicum continens.

Type: PAPUA NEW GUINEA. Madang Province: Bubura logging site, *ca*. 30 km NNW of Madang, 145°38′E, 4°50′S, alt. 70 m, in virgin rain forest on low hills, *P. Diederich 11929*, 28.vii.1992; LG-holotype.

Thallus pale olive-green, thin, corticolous, surface smooth and shiny, lacking soredia, isidiate; *isidia* numerous, short, simple, smooth, 0.2-0.3 mm tall, 0.1 mm diam.; *apothecia* not seen.

Chemistry: K-, KC-, C-, Pd-; 2′-*O*-methylperlatolic acid (major).

Pertusaria burburana is one of a number of sterile isidiate *Pertusaria* species that are differentiated by their chemistry. It resembles *P. wauensis* (*vide infra*) but is distinguished from that species by the Pd+ yellow reaction and the presence of psoromic acid. *P. buburana* is known only from the type specimen.

Pertusaria coniophora Elix & A.W. Archer, sp. nov. Fig. 2

Thallus pallido-hinnuleus, corticola, superficies laevis et hebetata, sorediis destituta, isidiata; isidia conspicua, numerosa, spisse conferta, friabilis, simplicia, thallo concoloria, 1.5-2 mm alta, 1 mm diam.; apothecia ignota. Thallus acida perlatolicum, confluenticum et 2-*O*-methylconfluenticum continens.

Type: AUSTRALIA. Victoria: Cape Conran, 18 km E of Marlo, 37°49′S, 148°44′E, alt 1m, on dead wood in coastal scrub, *J.A. Elix 5297*, 21.xi.1978; CANB-holotype.

Thallus pale fawn, surface smooth and dull, corticolous; lacking soredia, isidiate; *isidia* conspicuous, numerous, densley packed, fragile, simple, concolorous with the thallus, 1.5-2 mm tall, 1 mm diam.; *apothecia* not seen.

Chemistry: K-, KC-, C-, Pd-; perlatolic, confluentic and 2-*O*-methylconfluentic acids.

Pertusaria coniophora is characterised by the densely packed, fragile isidia and by its chemistry. The isidia are easily broken and then give the thallus a sorediate appearance. The epithet "coniophora" (dust-bearing) refers to the pseudo-sorediate appearence of the thallus. The new species is so far known only from the type specimen.

Pertusaria doradorensis Elix & A.W. Archer, sp. nov. Fig. 3

Thallus albidus, tenuis, corticola, superficies laevis et hebetata, isidiis et sorediis destituta; apothecia verruciformia, conspicua, sparsa, plano-hemisphaerica, thallo concoloria, basibus constrictis, 1.0-1.5 mm diam.; ostiola nigra, in verrucis 2na, punctiformia in zona hyalina; ascosporae 4nae, ellipsodeae, laeves, (82-)95-125 µm longae, 35-40 µm latae.
Thallus 4,5-dichlorolichexanthone et acida planaicum et 2-*O*-methylperlatolicum continens.

Type: AUSTRALIA. New South Wales: Dora Dora State Forest, Murphys Track, 18 km SE of Holbrook, 35°52′S, 147°28′E, alt. 620 m, on dead *Acacia*, *J.A. Elix 22975*, 15.xi.1989; CANB-holotype.

Thallus off-white, thin, corticolous, surface smooth and dull, lacking soredia and isidia; *apothecia* verruciform, conspicuous, sparse, flattened hemispherical, constricted at the base, becoming concave above, 1-1.5 mm diam.; *ostioles* black, punctiform, in a hyaline zone, 1-2 per verruca; *ascospores* 4 per acus, ellipsoid, smooth, (82-)95-125 µm long, 35-40 µm wide.

Chemistry: K-, KC-, C-, Pd-; 4,5-dichlorolichexanthone (minor), planaic acid (major) and 2-*O*-methylperlatolic acid (minor).

Pertusaria doradorensis is characterised by the chemistry and the 4-spored asci. The species is distinguished from the chemically similar *P. planaica* A.W. Archer & Elix (Archer & Elix 1992) by the number of ascospores (eight per ascus in *P. planaica*), the larger conspicuous verrucae and the presence of 2-*O*-methylperlatolic acid. *P. doradorensis* is so far known only from the type specimen.
The epithet "doradorensis" refers to the Dora Dora State Forest, the type locality.

Pertusaria gongylospora Elix & A.W. Archer, sp. nov.

Thallus cineraceus, tenuis, rimosus, corticola, superficies laevis et hebetata; apothecia disciformia, dispersa, 0.8-1.5 mm diam., marginibus involutis, disci albi; ascosporae 8nae, globosae, 20-25 µm diam.

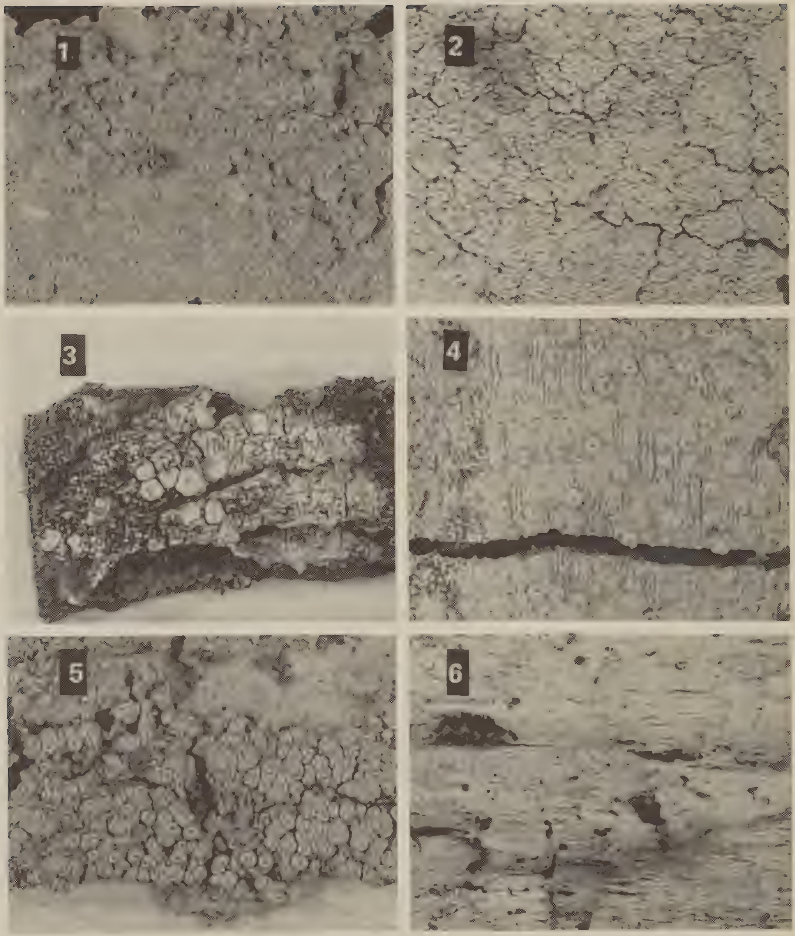
Type: PAPUA NEW GUINEA. Simbu Province: Mount Wilhelm area, near Lake Piunde, 145°03'E, 5°47'S, alt. 3500 m, *A. Aptroot 18606*, iii.1987; CANB-holotype; ABL-isotype.

Thallus off-white, thin, cracked, corticolous, surface smooth and dull, lacking isidia and soredia; *apothecia* disciform, scattered, 0.8-1.5 mm diam., margins inrolled, surface of disc white; *ascospores* 8 per ascus, 1-seriate, globular, 20-25 µm diam.

Chemistry: K+ yellow, KC bleach ,C-, Pd+ yellow; thamnolic acid (major).

Specimens examined:
PAPUA NEW GUINEA. type locality, near the hut, *A. Aptroot 31418, 32737* (herb. Aptroot); Madang Province: Finisterre range, Tetep Village, *A. Aptroot 30984* (herb. Aptroot).

Pertusaria gongylospora is distinguished from the chemically similar *P. epitheciifera* Sipman, which also occurs in Papua New Guinea, by the globular, 1-seriate ascospores; the ascospores are ellipsoid, 30-50 µm long and 2-seriate in *P. epitheciifera*.
The epithet "gongylospora", from the Greek *gongylos*, round, refers to the globular spores.



Figures **1-6**. New species of *Pertusaria*. (x 2.5).

1. *Pertusaria amnicola*; 2. *Pertusaria coniophora*; **3**. *Pertusaria doradorensis*; **4**. *Pertusaria kagamugana*; **5**. *Pertusaria streimannii*; **6**. *Pertusaria wauensis*.

Pertusaria gorokorana Elix & A.W. Archer, sp. nov.

Thallus olivaceus, tenuis, corticola, superficies subtuberculata et hebetata, isidiis et sorediis destituta; apothecia verruciformia, plano-hemisphaerica, thallo concoloria, conspicua, numerosa, dispersa, 0.4-0.7 mm diam.; ostiola inconspicua, in verrucis singula, albo-hinnulea in zona subhyalina; ascosporae 8nae, biseriatae, ellipsodeae, laeves, 50-60 µm longae, 20-25 µm latae.
Thallus atranorin et acidum confluenticum continens.

Type: PAPUA NEW GUINEA. Eastern Highlands Province: Goroka, in the vicinity of the hotel, on street trees, 4000 ft. [1220 m], *W.A. Weber & D. McVean s.n.*, 22.vi.1968; COLO L-50420-holotype.

Thallus olive-green, thin, surface subtuberculate, dull, lacking isidia and soredia; corticolous; *apothecia* verruciform, flattened-hemispherical, concolorous with the thallus, inconspicuous, scattered, 0.4-0.7 mm diam.; *ostioles* inconspicuous, pale brown, translucent, 1 per verruca; *ascospores* 8 per ascus, 2-seriate, ellipsoid, smooth, 50-60 µm long, 20-25 µm wide.

Chemistry: K-, KC-, C-, Pd+ weak yellow; atranorin (major), chloroatranorin (trace) and confluentic acid (minor).

Pertusaria gorokorana is characterised by the 8 biseriate ascospores per ascus and the chemistry. It is distinguished from the somewhat similar *P. weberi* (*vide infra*) by the smaller verrucae, the biseriate spores and the absence of 4,5-dichlorolichexanthone. The species is so far known only from the type specimen.
The epithet "gorokorana" refers to the town of Goroka, the type locality.

Pertusaria kagamugana Elix & A.W. Archer, sp. nov. Fig. 4

Thallus albido-olivaceus, tenuis, corticola, superficies laevis et hebetata, isidiis et sorediis destituta; apothecia verruciformia, plano-hemisphaerica, thallo concoloria, conspicua, numerosa, dispersa, 0.8-1.2 mm diam.; ostiola inconspicua, albo-hinnulea, in verrucis singula, albo-hinnulea in zona subhyalina; ascosporae 8nae,uniseriatae, ellipsodeae, laeves, 60-75 µm longae, 23-26 µm latae.
Thallus acidum 2-*O*-methylstenosporicum continens.

Type: PAPUA NEW GUINEA. Western Highlands Province: Forestry Station, Kagamuga, 9 km E of Mount Hagen, 5°51'S, 144°18'E, alt. 1560 m, on *Grevillea robusta*, *H. Streimann 21293*, 28.vi.1982; CANB-holotype; LAE-isotype.

Thallus pale greyish green, thin, corticolous, surface smooth and dull, lacking soredia and isidia; *apothecia* verruciform, conspicuous, numerous, scattered, flattened-hemispherical, concolorous with the thallus, 0.8-1.2 mm diam.; *ostioles* inconspicuous, pale brown to black, 1 per verruca; *ascospores* 8 per ascus, 1-seriate, ellipsoid, smooth, 60-75 µm long, 23-26 µm wide.

Chemistry: K-, KC-, C-, Pd-; 4,5-dichlorolichexanthone (trace) and 2-*O*-methylstenosporic acid (major).

Pertusaria kagamugana is characterised by the 8 uniseriate ascospores per ascus and the chemistry. The new species is distinguished from the chemically similar *P. leucoplaca* Müll.Arg. (Müller 1884, Archer & Elix 1992) by the smaller uniseriate spores; in *P. leucoplaca* the spores are biseriate and 70-90 µm long. The new species is so far known only from the type specimen.
The epithet "kagamugana" refers to Kagamuga, the type locality

Pertusaria streimannii Elix & A.W. Archer, sp. nov. Fig. 5

Thallus albido-olivaceus vel olivaceus, corticola, superficies laevis et hebetata, saepe rugosa, isidiis et sorediis destituta; apothecia verruciformia, conspicua, numerosa, aggregata sed raro confluentia, plano-hemisphaerica, thallo concoloria, basibus constrictis, 0.6-1.0 mm diam.; ostiola inconspicua, in verrucis 1-5nae, nigra, punctiformia in zona hyalina; ascosporae 4nae, ellipsodeae, laeves, (87-)105-115 µm long, 30-37 µm latae.
Thallus 4,5-dichlorolichexanthone et acidum 2-*O*-methylisohyperlatolicum continens.

Type: PAPUA NEW GUINEA. Morobe Province: Forestry College, Bulolo, 7°10'S, 146°40'E, alt. 730 m, on *Calliandra surinamensis* in maintained garden, *H. Streimann 14118*, 31.i.1981; CANB-holotype.

Thallus pale olive-green to olive-green, corticolous, surface smooth, sometimes becoming wrinkled, somewhat shiny, lacking isidia and soredia; *apothecia* verruciform, conspicuous, numerous, crowded but rarely confluent, flattened hemispherical, concolorous with the thallus, constricted at the base, becoming concave above, 0.6-1.0 mm diam.; *ostioles* inconspicuous, black, punctiform, 1 to 5 in a grey translucent zone; *ascospores* 4 per ascus, ellipsoid, smooth, (87-)105-115 µm long, 30-37 µm wide.

Chemistry: K-, KC-, C-, Pd-; 4,5-dichlorolichexanthone (major), 2-chlorolichexanthone (minor), 2,5-dichlorolichexanthone (trace) and 2-*O*-methyisohyperlatolic acid (minor) ± 2-*O*-methylhyperlatolic acid (minor) and 2-*O*-methylperlatolic acid (minor).

Specimens examined:
PAPUA NEW GUINEA. Central Province: Eilogo Plantation, 7 km SW of Sogeri, 9°27'S, 147°28'E, alt. 580 m on trunk of fallen *Hevea*, *H. Streimann 16687*, 16.ii.1981 (CANB); Morobe Province: near Nauti Village, Upper Watut River, 15 km SW of Bulolo, 7°18'S, 146°34'E, alt. 860 m, on semi-shaded tree trunk, *H.*

Streimann 13464, 28.i.1981 (CANB); type locality, on *Calliandra surinamensis*, *H. Streimann 14108*, 31.i.1981 (CANB).

Pertusaria streimannii is characterised by the 4-spored asci and the chemistry. It is distinguished from the somewhat similar *P. hermaka* A.W. Archer (Archer 1991), described from Australia, by the presence of 2-*O*-methyl substituted depsides; *P. hermaka* contains 2′-*O*-methylperlatolic acid.
The epithet "streimannii" refers to the collector, Heinar Streimann, who has collected lichens and bryophytes extensively in Papua New Guinea.

Pertusaria subsorodes Elix & A.W.Archer, sp. nov.

Sicut *Pertusaria sorodes* Stirton sed acidum 2′-*O*-methylperlatolicum continens.

Type: PAPUA NEW GUINEA. Simbu Province: Mout Wilhelm, Pindaunde Valley, near the hut on the shore of Lake Pinde, 145°03′E, 5°47′E, alt. 3600 m, *P. Diederich 10371*, 5.viii.1992; LG-holotype.

Thallus off-white, thin, cracked, corticolous, surface smooth and shiny, lacking isidia and soredia; *apothecia* verruciform, conspicuous, flattened-hemispherical, concolorous with the thallus, 0.8-1.0 mm diam.; *ostioles* conspicuous, black, 0.3 mm diam.; *ascospores* 2 per ascus, subfusiform, rough, 212-255 µm long, 55-85 µm wide.

Chemistry: K-, KC-, C-, Pd-; 2′-*O*-methylperlatolic acid (major).

Specimens examined:
PAPUA NEW GUINEA. type locality, *P. Diederich 10201*, 5.viii.1992 (herb. Diederich); Madang Province: Huon Peninsula, Finisterre Range, Yupna Valley, Teptep Village, 146°33′E, 5°57′S, alt. 2750 m, *H. Sipman 35449*, 30.vii.1992 (B).

Pertusaria subsorodes is characterised by asci with 2 large rough-walled ascospores and the chemistry. It is differentiated from *P. sorodes* Stirt., from New Zealand, by the chemistry. *Pertusaria sorodes* contains 4,5-dichlorolichexanthone and perlatolic and stenosporic acids.

Pertusaria wauensis Elix & A.W. Archer, sp. nov. Fig. 6

Thallus pallido-hinnuleus, corticola, superficies laevis et hebetata; sorediis destituta, isidiata; isidia inconspicua, dispersa, simplicia, thallo concoloria, 0.3-0.6 mm alta, 0.1 mm diam.; apothecia ignota.
Thallus acidum psoromicum continens.

Type: PAPUA NEW GUINEA. Morobe Province: Mount Kaindi, 5 km W of Wau, 7°21′S, 146°41′E, alt. 2360 m, on dead tree, *H. Streimann 17629*, 13.iii.1982; CANB-holotype.

Thallus pale fawn, surface smooth and dull; corticolous; lacking soredia, isidiate; *isidia* inconspicuous, scattered, simple, concolorous with the thallus, 0.3-0.6 mm tall, 0.1 mm wide; *apothecia* not seen.

Chemistry: K-, KC-, C-, Pd+ yellow; psoromic acid (major) and conpsoromic acid (minor).

Specimens examined :
MALAYSIA. Sarawak: Mount Penrissen, 1°7′33′′N, 110°12′52′E, alt. 1200 m, *L.B. Din, Penri 10,* 9.xii.1994 (NSW).
NORFOLK ISLAND. Picnic Area, end of Martins Road, 29°03′S, 167°59′E, alt. 80 m, on trunk of *Elaeodendron*, *J.A. Elix 18163*, 1.xii.1984 (CANB).

Pertusaria wauensis is characterised by the pale fawn thallus with tiny scattered isidia and the chemistry. It is distinguished from two other isidiate species that also occur in Papua New Guinea, viz. *P. monpittensis* A.W. Archer, with 4,5-dichlorolichexanthone and stictic acid (Elix, Streimann & Archer 1992), described from Norfolk Island, and *P. ramulifera* H. Magn., with norstictic acid (*vide infra*), described from Hawaii, by the smaller isidia and the chemistry.

Pertusaria weberi A.W. Archer & Elix, sp. nov.

Thallus albido-olivaceus, corticola, superficies laevis et hebetata, subrimosa, isidiis et sorediis destituta; apothecia verruciformia, numerosa conspicua, raro confluentia, plano-hemisphaerica, thallo concoloria, 1.0-1.5 mm diam.; ostiola inconspicua, nigra, 0.1-0.15 mm diam., in verrucis singula; ascosporae 8nae, uniseriatae, ellipsoideae, laeves, 60-75 µm longae, 25-30 µm latae.
Thallus 4,5-dichlorolichexanthone et acidia confluenticum et 2′-O-methylperlatolicum continens.

Type: PAPUA NEW GUINEA. Eastern Highlands Province: 18 miles [29 km] NW of Goroka on road to Marafunga, 5500 ft. [1676 m], on base of tree, *W.A. Weber & D. McVean s.n.*, 22.vi.1968; COLO L-50414-holotype.

Thallus pale olive-green, corticolous, surface smooth and dull, slightly cracked, lacking isidia and soredia; *apothecia* verruciform, numerous, conspicuous, rarely confluent, flattened-hemispherical, becoming slightly concave above, 1.0-1.5 mm diam.; *ostioles* inconspicuous, black, 0.1-0.15 mm diam., 1 per verruca; *ascospores* 8 per ascus, 1-seriate, ellipsoid, smooth, 60-75 µm long, 25-30 µm wide.

Chemistry: K-, KC-, C-, Pd-; 4,5-dichlorolichexanthone (minor), confluentic acid (major), planaic acid (minor) and 2′-*O*-methylperlatolic acid (trace).

Pertusaria weberi is characterised by numerous conspicuous verrucae, asci with 8 one-seriate ascospores and by the chemistry. It is distinguished from the somewhat similar *P. gorokorana* (*vide supra*) by the one-seriate ascospores and

the presence of 4,5-dichlorolichexanthone, and from *P. kagamugana* by the chemistry.
The new species is so far known only from the type specimen and is named in honour of the collector, Professor William A. Weber, who has collected lichens in many parts of the world, including Papua New Guinea.

NEW REPORTS:
Pertusaria consanguinea Müll.Arg., *Flora* **67**: 283(1884).

Type: BRAZIL. Apiahy, *J.I. Puiggari s.n.*, 1880; G-lectotype.

Thallus off-white to pale fawn, thin, scattered and dispersed on the substrate, surface smooth and dull, margin well-defined, lacking soredia and isidia; saxicolous; *apothecia* verruciform, conspicuous, scattered, sometimes confluent, flattened-hemispherical to subglobular, often constricted at the base, 0.6-1.5(-3) mm diam.; *ostioles* inconspicuous, black, punctiform, sometimes sunken, 1-2 per verruca; *ascospores* 8 per ascus, uniseriate, ellipsoid to subfusiform, smooth, (60-)75-90(105) µm long, 35-50 µm wide.

Chemistry: K-, KC-, C-, Pd-; lichexanthone (minor to trace) and 2-*O*-methylperlatolic acid (major).

Specimens examined:
PAPUA NEW GUINEA. Varirata Plateau, 22 km E of Port Moresby, alt. 700 m, on conglomerate rock outcrop, *A. Aptroot 19035, 19049*, iii.1987 (herb. Aptroot).

Pertusaria consanguinea is characterised by the 8-spored asci and the chemistry. It also occurs in Australia (Archer 1991) and Hawaii (Magnusson 1955).

Pertusaria copelandii Vainio, *Philipp.J.Sci.*, Sect. C, 8, **2**: 105 (1913).

Type: PHILIPPINES. Panay, Capiz, on branch with *Duldinia*, *E.B. Copeland 38 p.p.*, 10.i.1904; TUR-V 6749-holotype.

Specimens examined:
PAPUA NEW GUINEA. Central Province: KB Sawmill, Ehu Creek, 13 km SW of Sogeri, 9°29'S, 147°31'E, alt. 600 m, on upper branches of a large tree, *H. Streimann 16497*, 16.ii.1981 (CANB, H, LAE); *ibid.*, 12 km SW of Sogeri, 750 m, in crown of large *Castanopsis*, *H. Streimann 16669*, 16.ii.1981 (CANB, LAE).

Thallus dull fawn, corticolous, surface subtuberculate, lacking isidia and soredia; *apothecia* verruciform, conspicuous, subspherical, 1.5-2.5 mm diam., 1.0-1.5 mm high, surface of apothecia subtuberculate; *ostioles* inconspicuous, not seen; *ascospores* 2-4 per ascus, elongate-ellipsoid, smooth, 1-seriate, (125-) 163-200(-245) µm long, 37-50 µm wide.

Chemistry: K-, KC-, C-, Pd-; 4,5-dichlorolichexanthone (minor-trace), 2'-*O*-methylperlatolic acid (major) ± planaic acid (submajor), stictic acid (minor) and constictic acid (trace).

Pertusaria copelandii is characterised by large conspicuous verrucae with inconspicuous ostioles and large subfusiform ascospores, and the chemistry. The asci initially contain 3-4 immature ascospores but eventually may contain 2, 3 or 4 mature ascospores, *ca.* 200 µm long.
Vainio (*loc. cit.*) and Oshio (*in. sched.*) also reported the variable number of ascospores in the asci.

Pertusaria elliptica Müll.Arg., *Bull. Herb. Boissier* **3**: 635 (1895).

Type: AUSTRALIA. Queensland: Goodna, *J.F. Shirley 1754 p.p.*, 1893; G-holotype.

Thallus off-white or pale grey to pale olive-green, thin, corticolous, surface smooth or slightly rough and dull; *apothecia* verruciform, conspicuous, scattered, slightly flattened-hemispherical, rounded or elongated or irregular in outline, becoming constricted at the base and concave above, 0.5-1.5 mm diam.; *ostioles* conspicuous, black, sometimes in a grey translucent zone, 1-2 per verruca; *ascospores* 3-4 per ascus, uniseriate, elongate ellipsoid to subfusiform, rough, 80-110 µm long, 30-45 µm wide.

Chemistry: K-, KC-, C-, Pd-; 2,5-dichlorolichexanthone (major), 2,4,5-trichlorolichexanthone (major), 2,4-dichlorolichexanthone (trace), 2-chlorolichexanthone (minor), 4,5-dichlorolichexanthone (trace), 2'-*O*-methylperlatolic acid (minor), 2-*O*-methylperlatolic acid (minor).

Specimen examined:
PAPUA NEW GUINEA. Madang Province: near Bogia, along Bogia-Josephstaal road, on felled tree in garden, *P. Diederich 11492*, 25.vii.1992 (herb. Diederich).

Pertusaria elliptica is characterised by the verruciform apothecia with conspicuous black ostioles, the 3 or 4 rough ascospores per ascus and the chemistry. In Australia the species occurs in New South Wales and Queensland and it is also found in New Caledonia (Archer 1991).

Pertusaria hermaka A.W. Archer, *Mycotaxon* **41**: 227 (1991).

Type: AUSTRALIA. Queensland: 3 km S of Forest Beach, 16 km S of Ingham, edge of strand vegetation, *J.A. Elix 15939*, 22.vi.1984; CANB-holotype.

Thallus pale greyish green, wrinkled and folded, cracked, corticolous, surface dull; *apothecia* verruciform, conspicuous, numerous, hemispherical, becoming constricted at the base, sometimes confluent, 0.7-1.5 mm diam.; *ostioles* inconspicuous, hyaline, rarely dark, flat or somewhat papilliform, 1-4 per verruca; *ascospores* 4 per ascus, elongate-ellipsoid, smooth, 90-125(-150) µm long, 25-40 µm wide.

Chemistry: K-, KC-, C-, Pd-; 2'-*O*-methylperlatolic acid (major) usually with 4,5-dichlorolichexanthone (minor) ± stictic acid (minor).

Specimens examined:
PAPUA NEW GUINEA. Central Province: Motopore Island, in Bootless Bay, 12 km SE of Port Moresby, *A. Aptroot 17263*, ii.1987 (herb. Aptroot); Madang Province: near Bogia, along Bogia-Josephstaal road, *P. Diederich 11469*, 27.vii.1992 (herb Diederich).

Pertusaria hermaka is a tropical species characterised by the 4-spored asci and the chemistry. It occurs in northern Queensland (Archer 1991) and Papua New Guinea.

Pertusaria howeana A.W. Archer & Elix, *Telopea* **6**: 15 (1994).

Type: AUSTRALIA. New South Wales: Lord Howe Island, Neds Beach Road at Malabar Hill Track, on *Cryptocarya*, *J.A. Elix 32889*, 22.vi.1992; CANB-holotype.

Thallus off-white to dull yellowish green, areolate and cracked, corticolous, surface smooth and dull, lacking isidia and soredia; *apothecia* verruciform, conspicuous, numerous, scattered, flattened-hemispherical, sometimes becoming constricted at the base and distorted, 0.8-1.5(-2.0) mm diam.; *ostioles* inconspicuous, black or translucent, 1(-2) per verruca; *ascospores* 8 per ascus, irregularly 2-seriate, ellipsoid to subfusiform, (65-)75-87 µm long, 30-35 µm wide.

Chemistry: K-, KC+ yellow-orange, C+ yellow-orange, Pd-; arthothelin (major), 6-*O*-methylarthothelin (major), 2,5-dichloronorlichexanthone (minor), 2,7-dichloronorlichexanthone (minor) and 4,5-dichloronorlichexanthone (trace).

Specimen examined:
PAPUA NEW GUINEA. Madang Province: Madang, in park in city, *A. Aptroot 30096*, 18.vii.1992 (herb. Aptroot).

Pertusaria howeana is an uncommon species characterised by the 8 biseriate ascospores, the sometimes flattened verrucae and the presence of polychlorinated norlichexanthone derivatives. It occurs in New South Wales, Lord Howe Island and Papua New Guinea.

Pertusaria philippina Vainio, *Philipp.J.Sci.*, Sect. C, 8, **2**: 105 (1913).

Type: PHILIPPINES. Mindanao: Lanao, Castra Keithley at Lanao Lake, *Mary Strong Clemens 1302*, ix-x.1907; TUR-V 6391-holotype.

Thallus pale fawn to off-white, corticolous, surface smooth and slightly cracked, lacking isidia and soredia; *apothecia* disciform, numerous, crowded or scattered, 0.5-0.8(-1) mm diam., margins inrolled, discs pale fawn; *ascospores* 2 per ascus, ellipsoid, thin-walled, 105-125(-140) µm long, 30-37(-45) µm wide, spore wall 4-6 µm thick.

Chemistry: K-, KC+ orange-red, C+ red, Pd-; lecanoric acid, ± lichexanthone.

Specimens examined:
PAPUA NEW GUINEA. Morobe Province: logging area 15 km SW of Bulolo, 7°18′S, 146°45′E, alt. 1500 m, on upper branches of *Araucaria cunninghamii, H. Streimann 13121*, 27.I.1981 (B, CANB, H, LAE). *ibid.*, on upper branches of *Castanopsis*, *H. Streimann 13108*, 27.i.1981 (CANB, H, LAE).

Pertusaria philippina is characterised by the disciform apothecia, the 2-spored asci and the presence of lecanoric acid. Superficially, it resembles *P. velata* (Turner) Nyl., which also occurs in the same region (Archer, Elix & Streimann 1995), but is distinguished from that species by the 2-spored asci. The specimens from Papua New Guinea have somewhat less crowded apothecia than the holotype and contain lichexanthone in addition to lecanoric acid. The presence or absence of lichexanthone is not considered to have taxonomic significance (*cf. P. velata*, which also occurs with or without lichexanthone).

Pertusaria pseudococcodes Müll.Arg., *Flora* **67**: 287 (1884).

Type: SRI LANKA. "ad. arb. Ceylon", ex herb. *Hampe, s.n.*, 1877; G-holotype.

Pertusaria subradians Müll.Arg., *Flora* **67**: 463 (1884).

Type: SRI LANKA. *s. loc.*, *G. Thwaites s.n.*, 1876; G-holotype.

Thallus pale olive-green, slightly cracked, corticolous; *apothecia* verruciform, numerous, some-times confluent, flattened-hemispherical, concolorous with the thallus, 0.4-0.6 mm diam.; *ostioles* conspicuous, black, 1 per verruca; *ascospores* 2 per ascus, ellipsoid, smooth, (75-)85-110(-120) µm long, 30-40 µm wide.

Chemistry: K-, KC-,C-,Pd weak yellow; 4,5-dichlorolichexanthone (minor), stictic acid (major) and constictic acid (trace).

Specimen examined:
PAPUA NEW GUINEA. Madang Province: Ramu Valley, Brahman, along road to Bundi, in virgin lowland rain forest, *A. Aptroot 31710*, 12.viii.1992 (herb. Aptroot).

Pertusaria pseudococcodes is characterised by asci with 2 smooth ascospores, the small verruca and the chemistry. The species occurs in Sri Lanka and Papua New Guinea.

Pertusaria psoromica A.W. Archer & Elix, *Mycotaxon* **50**: 206 (1994).

Type: NEW ZEALAND. North Island: Otamea County, Kaiwaka, *J.K. Bartlett 24219*, 1975-85; AK 192231-holotype.

Thallus dull fawn or pale olive-green, areolate and cracked, corticolous, surface smooth or subtubercular, somewhat shiny, lacking isidia, sorediate; *soralia* conspicuous, numerous, white, initially pustulate, composed of granular soredia, hemispherical or discoid, 0.5-2.0 mm diam.; *apothecia* not seen.

Chemistry: K-, KC-, C-, Pd+ intense yellow; psoromic acid (major) and conpsoromic acid (minor).

Specimen examined:
PAPUA NEW GUINEA. Madang Province: near Bogia, mouth of Boroi River, *P. Diederich 11722*, 21, vii.1992 (herb. Diederich).

Pertusaria psoromica is characterised by the sterile sorediate thallus and the presence of psoromic acid. It resembles *Pertusaria scaberula* A.W. Archer (which also occurs in Papua New Guinea) but is distinguished from that species by the chemistry. *P. psoromica* also occurs in Australia and New Zealand.

Pertusaria puffina A.W. Archer & Elix, *Telopea* **6**(1): 22 (1994).

Type: AUSTRALIA. New South Wales: Lord Howe Island, track to Mutton Bird Point, alt. 60 m, on basalt rocks, *J.A. Elix 32823*, vi.1992; CANB-holotype.

Thallus dull yellow, thin, cracked, saxicolous; lacking isidia, sorediate; *soredia* white, numerous, scattered; *apothecia* not seen.

Chemistry: K+ weak yellow, KC-, C-, Pd+ weak yellow; 2,4,5-trichlorolichexanthone (major), 2,4-dichlorolichexanthone (major), 2,5-dichlorolichexanthone (major), 2-chlorolichexanthone (minor), stictic acid (major) and constictic acid (minor).

Specimen examined:
PAPUA NEW GUINEA. Morobe Province: Aseki-Menyamya road, Spreader Divide, 11 km NW of Aseki, 7°16′S, 146°06′E, alt. 1930 m, on moist shaded road cutting, *H. Streimann 12186*, 21.1.1981 (CANB).

Pertusaria puffina is characterised by the white soralia and the chemistry. The specimen from Papua New Guinea was growing on soil and lacked a thallus, in contrast to the holotype from Lord Howe Island which was growing on rock. However, the chemistry of the two specimens is identical and on that basis the Papua New Guinea specimen is identified as *P. puffina*.

Pertusaria pycnothelia Nyl., *Synopsis Lich. Novae Caledoniae*: 31 (1868).

Type: NEW CALEDONIA. Lifu, *D.Thiébaut, s.n.*, 1864; H-NYL 22960-lectotype, here selected.

Pertusaria leioplaca Schaer. var. *dispora* Müll.Arg., *J. Bot*. **7**: 92 (1893).

Type: NEW CALEDONIA. near Ouroné, on *Calophyllum, B. Balansa s.n.*, 1870; G-holotype.

Thallus pale yellowish fawn, corticolous, surface smooth and slightly shiny, lacking isidia and soredia; *apothecia* verruciform, inconspicuous, numerous, confluent, sometimes forming an almost continuous crust, individual apothecia *ca*. 0.5 mm diam.; *ostioles* conspicuous, black, often surrounded by a conspicuous translucent zone, 1 per verruca; *ascospores* 2 per ascus, subfusiform smooth, (95-)110-125(-132) µm long, 30-40 µm wide.

Chemistry: K-, KC-, C-, Pd-; 4,5-dichlorolichexanthone (minor) and 2′-*O*-methylperlatolic acid (major).

Specimens examined:
NEW CALEDONIA. type locality, *D. Thiébaut s.n.*, 1864; (H-NYL 22961); *E. Marie s.n.*, 1863 (H-NYL 22962).
PAPUA NEW GUINEA. Samarai, on *Cocos nucifera, W. Fitzgerald s.n.*, ii. 1895 (H).

Pertusaria pycnothelia is characterised by the numerous apothecia, the 2-spored asci and the chemistry. The species is distinguished from the similar *P. damiensis* A.W. Archer, Elix & Streimann (Archer *et al*. 1995), which also occurs in Papua New Guinea, by the absence of stictic acid and the presence of 2′-*O*-methylperlatolic acid. *P. daimiensis* contains 2-*O*-methylperlatolic acid. Nylander (*loc. cit*.) referred to material collected in Lifu by Thiébaut and the better of the two specimens in the Nylander Herbarium (H-NYL 22960) fitting the description in the protologue is selected as lectotype. *P. leioplaca* Schaer. var. *dispora* is chemically and morphologically identical to *P. pycnothelia* Nyl.

Pertusaria ramulifera H. Magn., *Ark. Bot.* **31**A(6): 56 (1944).

Type: HAWAII. Maui: Honokowai ride, near Haelaau, 900 m, *H.B.S. 5772*, 1938; S-holotype.

Thallus pale to dark fawn, corticolous, conspicuously isidiate, *isidia* simple or often branched, 0.4-0.8 mm tall, 0.05-0.15 mm diam.; *apothecia* not seen.
A detailed description of the species is given by Magnusson, *loc. cit.*

Chemistry: K+ red, KC-, C-, Pd+ yellow; norstictic acid (major) and connorstictic acid (trace).

Specimens examined:
PAPUA NEW GUINEA. Eastern Highlands Province: Bismark Ranges, Mount Wilhelm, Pindaunde Valley, below the outlet of Lake Aunde, on *Podocarpus compactus*, 11,000 ft [3353 m], *W.A. Weber & D. McVean, L-48673, L-78137*, 2.vii.1968 (COLO); *ibid.*, Imbuka Ridge above Lake Aunde, 12,000 ft [3658 m], *W.A. Weber & D. McVean, L-48483*, 26.vi.1968 (COLO); *ibid.*, vicinity of Lake Aunde, 11,3000 ft [3444 m], *L.K. Wade, L-48784*, 1960 (COLO); *ibid.*, shore of Lake Piunde, on *Cyathea*, *P. Diederich 10141, 10238*, 5.viii.1992 (herb. Diederich); Mount Gahavisuka Provincial park, 11 km N of Goroka, *P. Diederich 10548*, 3.viii.1991 (herb. Diederich).

Pertusaria ramulifera is characterised by the conspicuously isidiate thallus and the presence of norstictic acid. It is distinguished from *Pertusaria wauensis*, (*vide supra*) by the larger and often branched isidia and the chemistry. The species has also been reported from India (Magnusson 1955).

Pertusaria subplanaica A.W. Archer & Elix, *Mycotaxon* **45**: 422 (1992).

Type: AUSTRALIA. New South Wales: Patterson River [near junction with Hunter River, *ca.* 10 km E of Maitland, 32°44'S, 151°33'E], *J. L. Boorman s.n.*, viii.1906; NSW-holotype.

Thallus pale olive-green, somewhat cracked, corticolous, surface smooth and dull, lacking isidia and soredia; *apothecia* verruciform, conspicuous, dispersed, sometimes confluent, concolorous with the thallus, flattened-hemispherical, constricted at the base, 0.8-1.5 mm diam.; *ostioles* inconspicuous, brown, 1 per verruca; *ascospores* 8 per ascus, irregularly uniseriate, smooth, ellipsoid becoming fusiform, (60-)80-100(-120) µm long, 30-40 µm wide.

Chemistry: K-, KC-, C-, Pd-; 4,5-dichlorolichexanthone (minor), 2,2'-di-*O*-methylstenosporic acid (major), 2'-*O*-methylstenosporic acid (minor), 2'-*O*-methylperlatolic acid (minor), planaic acid (trace) and 2,2'di-*O*-methyldivaricatic acid (trace).

Specimen examined:
PAPUA NEW GUINEA. Eastern Highlands Province: Mount Kiss Kiss, 1 km E of Goroka, *A. Aptroot 18922*, iii.1987 (herb. Aptroot).

Pertusaria subplanaica is characterised by the 8-spored asci and the chemistry. It occurs in eastern Australia and Papua New Guinea.

Pertusaria vulpina A.W. Archer, *Mycotaxon* **41**: 249 (1991).

Type: AUSTRALIA. Queensland: Mount Fox, 43 km SW of Ingham, 18°15'S, 145°42'E, alt. 780 m, on vesicular basalt, *J.A. Elix 20326*, 19.vi.1986; CANB-holotype.

Thallus pale fawn, thick, saxicolous, surface smooth and dull, areolate and cracked, lacking isidia and soredia; *apothecia* verruciform, flattened-hemispherical, numerous, conspicuous, sometimes confluent, sometimes becoming constricted at the base, 0.6-0.8 mm diam., confluent verrucae irregular in outline, to 3 mm wide; *ostioles* conspicuous, black, 0.2-0.4 mm diam., 1-2 per verruca; *ascospores* usually 2 per ascus, ellipsoid, smooth, 135-175 µm long, 30-45 µm wide; rarely 1 per ascus, 220 µm long, 50 µm wide.

Chemistry: K+ weak yellow, KC-, C-, Pd-; 4,5-dichlorolichexanthone (major), stictic acid (major) and constictic acid (minor).

Specimen examined:
PAPUA NEW GUINEA. Morobe Province: Yakwoi River, 2 km NW of Menyamya, 7°22'S. 146°00'E, alt. 1300 m, on rock beside river, *H. Streimann 19210*, 1.v.1982; (CANB, LAE).

Pertusaria vulpina is characterised by conspicuous verrucae, asci with 2 ascospores and the chemistry. Undeveloped asci in *P. vulpina* may contain three immature spores but two, or rarely one, developed spores are more usual. The specimen from Papua New Guinea also contained traces of skyrin.

ACKNOWLEDGEMENTS

The authors are grateful to the herbaria referred to above, to Professor L.B. Din (Sarawak), to Professor W. A. Weber (COLO), to Dr. P. Diederich and Dr. H. Sipman for the loan of specimens, to Mr. D. Verdon for checking the Latin descriptions and to Mrs. J. Wardlaw for technical assistance with liquid chromatography; one of us (AWA) is grateful to the National Herbarium of New South Wales (NSW) for arranging the loan of specimens and for permission to use the facilities of the herbarium and JAE gratefully acknowledges the Australian Research Council for generous financial support.

LITERATURE CITED

Archer, A.W. (1991). New species and new reports of *Pertusaria* (lichenised Ascomycotina) from Australia and New Zealand with a key to the species in Australia. *Mycotaxon* **41**: 223-269.

Archer, A.W. & Elix, J.A. (1992). Further new species and new reports of *Pertusaria* (lichenised Ascomycotina) from Australia. *Mycotaxon* **45**: 417-431.

Archer, A.W. (1993). A chemical and morphological arrangement of the lichen genus *Pertusaria. Biblioth. Lichenol.* **53**: 1-17.

Archer, A.W. & Elix, J.A.(1994). Additional new species and new reports of *Pertusaria* (lichenised Ascomycotina) from New Zealand with a revised key to the corticolous species in New Zealand. *Mycotaxon* **50**: 203-217.

Archer, A.W. & Elix, J.A. (1994a). The lichens of Lord Howe Island. 1. Introduction and the genus *Pertusaria* (Pertusariaceae). *Telopea* **6**: 9-30.

Archer, A.W., Elix, J.A. & Streimann, H. (1995). The lichen genus *Pertusaria* (lichenised Ascomycotina) in Papua New Guinea. *Mycotaxon* **56**: 387-401.

Elix, J.A., Streimann, H & Archer, A.W. (1992). The lichens of Norfolk Island .2: the Genera *Cladonia, Pertusaria, Pseudocyphellaria* and *Ramalina. Proc. Linn. Soc. N.S.W.* **113(1)**: 57-76.

Elix, J.A. & Ernst-Russell, K.D. (1993). *A Catalogue of Standardised Thin Layer Chromatographic data and Biosynthetic Relationships of Lichen Substances.* (2nd Edition) Australian National University, Canberra.

Elix, J.A., Malcolm, W.M. & Archer, A.W. (1995). New species of *Pertusaria* (lichenised Ascomycotina) from New Zealand, Australia and Venezuela. *Mycotaxon* **53**: 273-281.

Feige, G.B., Lumbsch, H.T., Huneck, S. & Elix, J.A. (1993). Identification of lichen substances by a standardised high performance liquid chromatographic method. *J. Chromatogr.* **646**: 417-427.

Galloway, D.J. (1985). "Flora of New Zealand Lichens", Government Printer, Wellington.

Magnusson, A.H. (1955). A catalogue of the Hawaiian lichens. *Ark. Bot.* ser. 2, **3**: 223-402.

Müller, J. (1884). Lichenologische Beiträge XIX. *Flora* **67**: 299-306; 349-354.

Vainio, E.A. (1921). Lichenes Siamenses. *Ann. Bot. Soc. Zool.-Bot. Fenn. "Vanamo"* **1**(3): 33-55.

MYCOTAXON

Volume LXIV, pp. 37-38 September 1997

CONTRIBUTION TO THE LICHEN FLORA OF BRAZIL. XXXII. *PSEUDOCYPHELLARIA INTRICATA* NEW TO BRAZIL.

Héctor S. Osorio
Departamento de Botánica
Museo Nacional de Historia Natural
Casilla de Correo 399
11.000 Montevideo URUGUAY

Abstract: *Pseudocyphellaria intricata* recently collected in Rio Grande do Sul State is added to the known lichen flora from Brazil and is an eastward extension of this taxon's range in South America.

INTRODUCTION

At present four species of *Pseudocyphellaria* VAINIO, are known from Brazil, viz., *P. aurata, P. aurora, P. clathrata* and *P. kalbii* (GALLOWAY 1993:87).

During April 1988 the author, together with Prof. MARIANA FLEIG from Porto Alegre, visited Canela in the Rio Grande do Sul Highlands (29°20'S, 50°53'W). Here, in an *Araucaria angustifolia* forest we collected a species of *Pseudocyphellaria* differing from other species in the genus then known from Brazil. The sorediate, white-medulla, cyanobacterial species proved to be *Pseudocyphellaria intricata* (DELISE) VAINIO, a species which is widespread throughout them tropics and also in cool temperate regions of the world (GALLOWAY 1988, 1992, 1994, GALLOWAY & ARVIDSSON 1990).

The known distribution of this species in southern South America can be summarized as follows: in Chile the northernmost station was reported from Fray Jorge National Park (GALLOWAY 1992:162). According with REDÓN and LANGE (1983:216) the location of this Park is: 30°38'-30°43'S-71°37'-71°43'W.

In Argentina the northernmost gathering was known from Victoria Island, Nahuel Huapí National Park, 41°00'S-71°35'W (MACKENZIE LAMB(1958:71).

The Brazilian station of this species is nearly at the same latitude of the northenmost Chilean collection. In the eastern region of the Andes mountain range the distribution of this taxon is enlarged 1200 km northwards.

The lichen species associated with this *Pseudocyphellaria* have already been published (OSORIO & FLEIG 1989).

Specimens examined:
BRAZIL: Rio Grande do Sul State, Canela, Parque do Sesi, alt. 800 m, 1988, on "canela tree" (*Ocotea or Nectandra* sp.) open place in *Araucaria angustifolia* forest, OSORIO & FLEIG 88/42 (BM, Herb. OSORIO).

CHILE: Coquimbo, Fray Jorge, 1966, J. Redón (Herb. Osorio)
TASMANIA: Saxons Road, 1.5 NW of Parrawe, 1991, Kantvilas at al. 407/91 (MVM).

Key to Brazilian *Pseudocyphellaria*:

1a Medulla white 2
1b Medulla yellow 4
2a Photobiont cyanobacterial .... *P. intricata*
2b Photobiont green 3
3a With phyllidia .... *P. kalbii*
3b Without phyllidia .... *P. aurora*
4a With yellow soredia .... *P. aurata*
4b Without soredia .... *P. clathrata*

ACKNOWLEDGEMENTS

Thanks are given to Dr. David J. Galloway for the revision of the Brazilian collection and for the critical reading this manuscript.

LITERATURE CITED

Galloway, D. J. 1988. Studies in *Pseudocyphellaria* (lichens) I. The New Zealand species. Bulletin of the British Museum (Natural History) Botany, 17:1-267, figs. 1-124. London.

Galloway, D. J. 1992. Studies in *Pseudocyphellaria* (lichens) III. The South American species. Bibliotheca Lichenologica, 46:1-275, plates 1-44, maps 1-40. Berlin-Stuttgart.

Galloway, D. J. 1993. Nomenclatural notes on *Pseudocyphellaria* V: Some Brazilian species. Tropical Bryology, 7:87-92, figs. 1-3. Duisburg.

Galloway, D. J. 1994. Studies in *Pseudocyphellaria* (Lichens) IV. Paleotropical species (excluding Australia). Bulletin of the Natural History Museum, Botany Series, 24(2):115-159, figs. 1-36. London.

Galloway, D. J. & L. Arvidsson. 1990. Studies in *Pseudocyphellaria* (Lichens) II. Ecuadorean species. Lichenologist, 22(2):103-135, figs. 1-16. London.

Mackenzie Lamb, I. 1959 ("1958"). La vegetación liquénica de los Parques Nacionales Patagónicos. Anales de Parques Nacionales, 7:1-188, figs. 1-13, colored plates 1-10. Buenos Aires.

Osorio, H. S. & M. Fleig. 1989. Contribution to the lichen flora of Brazil. XXII. Lichens from Canela, Rio Grande do Sul State. Comunicaciones Botánicas del Museo de Historia Natural de Montevideo, 5(88):1-4.

Redón, J. & O. L. Lange. 1983. Epiphytische Flechten im Bereich einer chilenischen "Nebeloase" (Fray Jorge). I. Vegetationskundliche Gliederung und Standortsbedingungen. Flora, 174:213-243, figs. 1-6. Jena.

MYCOTAXON

Volume LXIV, pp. 39-50 September 1997

JUMILLERA AND *WHALLEYA*, NEW GENERA SEGREGATED FROM *BISCOGNIAUXIA*

Jack D. Rogers and Yu-Ming Ju
Department of Plant Pathology
Washington State University
Pullman, Washington 99164-6430

and

Felípe San Martín
Instituto Tecnológico de Ciudad Victoria
Blvd. Emilio Portes Gil y Ave. Zeferino Fajardo
Apartado Postal no. 175
87010 Cd. Victoria, Tamaulipas, MEXICO

ABSTRACT

Jumillera and ***Whalleya*** are new genera to encompass taxa removed from ***Biscogniauxia*** on anamorphic and structural features. Taxa of ***Jumillera*** that have been cultured feature ***Libertella***-like anamorphs and, in several cases, ***Geniculosporium*** synanamorphs. ***Jumillera mexicana*** and ***J. albida*** are described as new; the former is the type species for the genus. ***Jumillera cinerea***, ***J. hypophlaea***, ***J. punctatobrunnea***, and ***J. viridis*** represent new combinations. ***Whalleya*** differs from ***Biscogniauxia*** and ***Jumillera*** in having soft whitish tissue between perithecia and in having dry scolecosporous conidia. The new combinations, ***W. microplaca*** and ***W. maculata***, are proposed, the former designated as the type of the genus.

KEY WORDS: ***Geniculosporium***, ***Libertella***, ***Nummularia***, systematics, Xylariaceae

During our studies of ***Biscogniauxia*** Kuntze we became aware that a number of taxa do not fit well into this or any extant genus. Developmentally, these anomalous taxa resemble ***Biscogniauxia*** in having, or appearing to have, bipartite stromata. Anatomically, however, the stromata differ from typical ***Biscogniauxia***. Moreover, the anamorphs and cultural characteristics differ from ***Biscogniauxia***. Two genera—***Jumillera*** and ***Whalleya***—are proposed. They are compared and contrasted with ***Biscogniauxia*** in Table 1.

The type species of ***Whalleya*** proposed herein, ***W. microplaca***, has long been recognized as an atypical member of ***Biscogniauxia*** (or ***Nummularia***) based upon its scolecosporous conidia, small ascospores, white fungal tissue surrounding perithecia, and hosts in Families Lauraceae and Myrtaceae (and see Glawe and Rogers, 1986). Its possible relationship with Family Diatrypaceae has been noted and discussed (Glawe and Rogers, 1986).

Our first encounter with a ***Biscogniauxia***-like taxon with wet scolecosporous conidia occurred with ***Nummularia viridis*** Theiss. (Ju et al., 1993). Further investigations have revealed other taxa with similar anamorphs and having, in addition, dry ***Geniculosporium***-like synanamorphs. Anamorphic features are correlated with generally small ascospores and stromatal interiors containing host material. ***Jumillera*** is proposed to accommodate taxa with such characters.

The wet scolecosporous conidium associated with stromatal locules or

Table 1. Comparison of ***Biscogniauxia***, ***Jumillera***, and ***Whalleya****

Character	***Biscogniauxia***	***Jumillera***	***Whalleya***
1. Stromatal layers	Bipartite	Bipartite or thought to be bipartite	Bipartite
2. Perithecium-bearing area of stroma	Carbonaceous (woody in several species)	Soft; some host material included	Soft, white fungal tissue
3. Ascospores	Lower end of length range usually about 10 µm, the upper end often exceeding 12 µm	Lower end of length range 7.5–8 µm, the upper end seldom exceeding 12 µm	Lower end of length range 4 µm, the upper end not exceeding 7 µm
4. Anamorph(s)	Anamorph usually ***Periconiella***-like or, less frequently, ***Nodulisporium***-like	Synanamorphs usually present: ***Libertella***-like with wet conidia; ***Geniculosporium***-like with dry conidia	Anamorph dry with scolecospores and peg-shaped dehiscence scars on conidiogenous cells
5. Cultures	Usually thin and fast-growing on SMEA, covering plate in 7 da. Colony often woolly with dark green reverse on OMA, covering plate in ca. 10 da.	Slow growth on SMEA, covering plate in 30 da. Colony appressed and fleshy with or without dark green reverse on OMA, covering plate in 30–40 da or never reaching plate perimeter	Slow growth on SMEA, covering plate in 21 da. Colony appressed and thin with greenish yellow reverse on OMA, covering plate in 21 da.

---

* Media employed are SMEA (Kenerley and Rogers, 1976) and OMA (2% oatmeal agar, Difco).

conidiomata has been encountered in several ***Anthostomella*** species (unpublished), ***Creosphaeria sassafras*** (Schwein.: Fr.) Y.-M. Ju, J. D. Rogers, & San Martín (Ju et al., 1993), ***Lopadostoma turgidum*** (Pers.: Fr.) Traverso (possibly *var.* ***minus*** Sacc.) (Ju et al., 1993), and ***L. polynesium*** (Berk. & M. A. Curtis) Rappaz (Rappaz, 1995). The latter taxon and two others that Rappaz put in subgenus ***Anthostomopsis*** Rappaz of ***Lopadostoma*** (Rappaz, 1995) are not currently accepted by us as ***Lopadostoma*** species. In our opinion they probably represent a distinct genus. In any case, there seem to be several essentially unrelated groups of taxa in the Xylariaceae that feature, among other characters, wet scolecosporous conidia. This is a cryptic character that usually is discovered only by culturing.

Lopadostoma pouzarii Granmo & L. E. Petrini has an anamorph reminiscent of that of ***Whalleya microplaca*** (Granmo and Petrini, 1996; unpublished data). Cultures on OMA are relatively slow-growing and lack a green reverse. Conidia are dry scolecospores borne on strongly denticulate conidiogenous cells that proliferate in a ***Geniculosporium***-like manner. Thus, in ***Lopadostoma*** *spp.* as well as among taxa formerly placed in ***Biscogniauxia*** (as ***Nummularia***) there appear to be both wet and dry conidia, respectively. It is possible that future studies will indicate desirable rearrangements within ***Lopadostoma***. It is even possible that the generic limits of ***Whalleya*** will require reconsideration.

The resemblances of stromata and anamorphs of taxa of ***Whalleya*** and of ***Jumillera*** to diatrypaceous fungi are striking. Nonetheless, the characteristic diatrypaceous ascus and allantoid ascospore are not really approached by these fungi. Thus, the interface between the Diatrypaceae and Xylariaceae—if one truly exists—is unclear. What we observe might represent convergent evolution reflecting selection pressure on structures (scolecoconidia, etc.) that are advantageous for exploiting common bark habitats.

Jumillera and ***Whalleya*** can be easily separated from ***Biscogniauxia*** by culturing. The latter genus often produces thin, fast-growing colonies with abundant conidia on SMEA and lanose colonies with a characteristic dark green reverse that blackens on OMA. ***Jumillera*** produces much slower-growing colonies with or without a dark green reverse on both media. The only ***Whalleya*** species to be cultured produces a greenish yellow reverse. Anamorphs of these three genera are strikingly different. Characters separating these genera are given in Table 1. Although culturing is highly desirable in separating ***Jumillera***, ***Whalleya***, and ***Biscogniauxia***, several new combinations and a new species have been erected for taxa that are (seem to be) infrequently encountered and which we have not had opportunity to culture.

Jumillera J. D. Rogers, Y.-M. Ju, & San Martín, *gen. nov.*

Etymology: For Julian H. Miller (Ju(lian) + millera), a renowned authority on the Xylariaceae.

A ***Biscogniauxia*** differt in textura mixta hospitis et fungi inter perithecia et in statu conidico ***Libertella*** simili.

Differs from ***Biscogniauxia*** in having a mixture of host and fungal tissue between perithecia and in having a ***Libertella*** conidial state.

Type species: ***J. mexicana*** J. D. Rogers, & Y.-M. Ju, & San Martín

Stromata applanate or effused-pulvinate, solitary or confluent, lacking KOH-extractable pigments; outer dehiscing layer dark brown, thin; externally white, gray, greenish, or black; internally with carbonaceous tissue immediately beneath surface, forming a crust; tissue between perithecia and beneath the perithecial layer mainly composed of host tissue. Perithecia globose to depressed-globose, monostichous. Ostioles lower than the level of stromatal surface and appearing punctate on the stromatal surface. Asci eight-spored, cylindrical, stipitate, persistent, with apical ring discoid, amyloid. Ascospores brown to dark brown, unicellular in both mature and immature ascospores, ellipsoid, nearly equilateral or inequilateral, with narrowly or broadly rounded ends, with straight germ slit; more or less gelatinous sheath sometimes present; epispore smooth.

Anamorph ***Libertella***-like, with ***Geniculosporium***-like synanamorph in several known species and probably universal.

KEY TO SPECIES OF *JUMILLERA*

1. Ascospores conspicuously inequilateral, 7.5–9 x 3.5–4 µm, surrounded by a hyaline sheath .... ***J. mexicana***
1. Ascospores nearly equilateral, lacking a hyaline sheath 2

    2. Mature stromatal surface white; ascospores 8.5–11 x 4–5 µm .... ***J. albida***
    2. Mature stromatal surface dull gray; ascospores 8.5–12 x 4–5 µm .... ***J. cinerea***
    2. Mature stromatal surface dull brown; ascospores 7–9 x 3–4 µm .... ***J. punctatobrunnea***
    2. Mature stromatal surface greenish to olivaceous; ascospores 7.5–10 x 3.5–4.5 µm .... ***J. viridis***
    2. Mature stromatal surface dull black; ascospores 7.5–11 x 3.5–4 µm .... ***J. hypophlaea***

Jumillera albida J. D. Rogers, Y.-M. Ju, & San Martín, *sp. nov.*

A ***Jumillera cinerea*** differt praecipue in superficie stromatis maturi albida.

Differs from ***Jumillera cinerea*** principally in the white surface of the mature stroma.

Stromata with the general characteristics of the genus, up to 2 cm long x 0.5–1.5 cm broad x 0.7–2 mm thick; mature surface white. Perithecia 0.2–0.3 mm diam. Ostioles lower than stromatal surface, with ostiolar openings appearing punctate. Asci 100–115 µm total length x 5.5–6.5 µm broad, the spore-bearing part 60–75 µm long, the stipe 30–40 µm long, with apical ring bluing in Melzer's iodine reagent, discoid, 0.5 µm high x 2 µm broad. Ascospores brown to dark brown, unicellular, ellipsoid, nearly equilateral, with broadly rounded ends, smooth, 8.5–11 x 4–5 µm, with straight germ slit spore-length.

SPECIMENS EXAMINED: BRAZIL: Montenegro, Municipio, Bono Principio, 1928, collector unknown, dead wood, as ***Hypoxylon griseum*** by Miller, J. H. (GAM 2728); Nova Petropolis, 1923, Rick, J. 226, decorticated wood, as ***Nummularia grisea*** (BPI 589605, HOLOTYPE; GZU-Petrak 1453, ISOTYPE of ***Jumillera albida***).

NOTES: This fungus is distinctive in having a white mature stromatal surface.

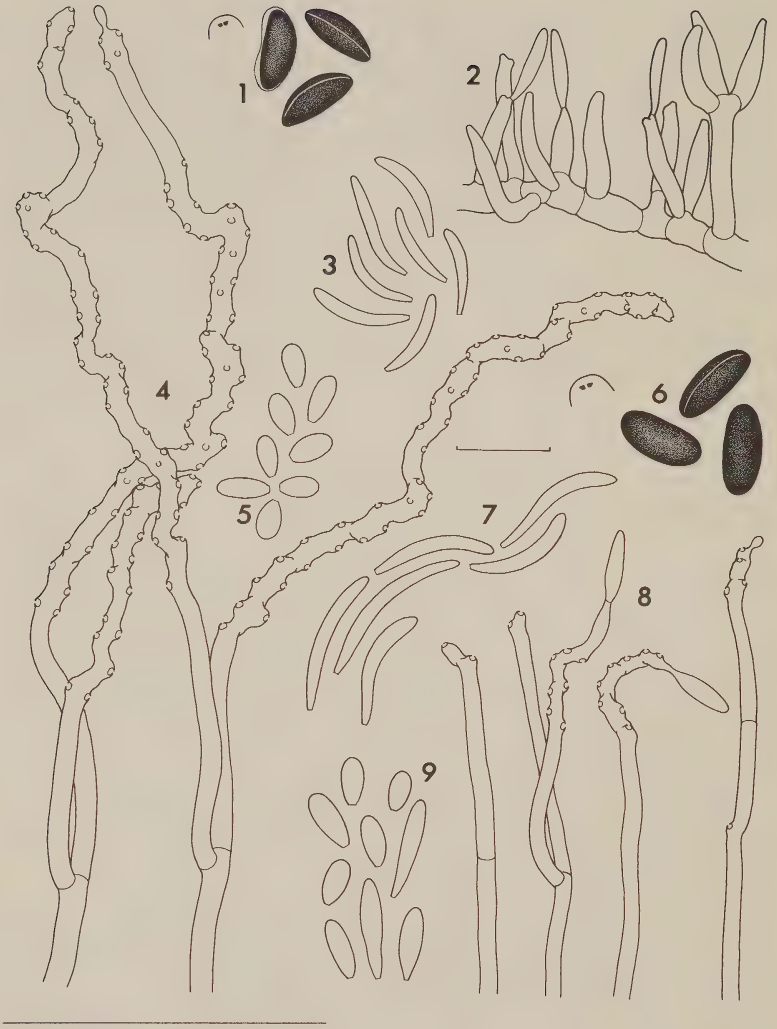
Jumillera cinerea (Ellis & Everh.) J. D. Rogers, Y.-M. Ju, & San Martín, *comb. nov.*

Figs. 6–9

≡ ***Hypoxylon cinereum*** Ellis & Everh., N. Amer. Pyren., p. 647. 1892.
= ? ***Nummularia cinerea*** Pat., Bull. Herb. Boiss. 3: 68. 1895; *non* Rehm, 1918.
= ***Nummularia grisea*** Rick, Ann. Mycol. 7: 13. 1909.

Stromata applanate or effused-pulvinate, solitary or confluent, 0.3–3 cm long x 0.3–1.5 cm broad x 0.3–0.4 mm thick; outer dehiscing layer dark brown, thin; mature surface dull gray, becoming black, sometimes cracked in the manner of ***Diatrype stigma***; carbonaceous tissue immediately beneath surface, forming a crust; tissue between perithecia and beneath the perithecial layer mainly composed of host tissue. Perithecia up to 0.1–0.3 mm diam. Ostioles lower than stromatal surface, with ostiolar openings appearing punctate, sometimes surrounded by slightly raised rim. Asci 95–110 µm total length x 4.5–6 µm broad, the spore-bearing part 70–90 µm long, the stipe 20–30 µm long, with apical ring bluing in Melzer's iodine reagent, discoid, 0.5 µm high x 2 µm broad. Ascospores brown to dark brown, unicellular, ellipsoid, nearly equilateral, with narrowly to broadly rounded ends, smooth, 8.5–12 x 4–5 µm, with straight germ slit spore-length.

Colonies on 2% Difco oatmeal agar incubated at 20°C and 12 h of fluorescent light covering Petri dish in 4–5 wk, at first whitish, velvety, with diffuse margins, soon showing alternating bright yellow and greenish olivaceous concentric zones. Reverse uncolored. Two synanamorphs produced. ***Libertella***-like synanamorph: Conidium-bearing regions distributed within or upon irregular stromatized areas which are dull green on the surface. Conidiophores di- or trichotomously branched, with hyaline to pale brown stipes, smooth-walled, arranged in dense palisades. Conidiogenous cells terminal, cylindrical, smooth, 20–30 x 1.5–2 µm, bearing slightly denticulate secession scars. Conidia produced holoblastically in sympodial sequence. Conidia hyaline, dull green in slimy masses, smooth, long cylindrical, slightly curved, 10–18 x 1–2 µm, with flattened base indicating former point of attachment to conidiogenous cell. ***Geniculosporium***-like synanamorph: Conidium-bearing regions usually distributed upon the stromatized areas. Conidiophores unbranched or occasionally branched, hyaline, smooth-walled. Conidiogenous cells terminal, long cylindrical, smooth, 15–30 x 2 µm, bearing poroid secession



Figs. 1–9. ***Jumillera*** species. 1–5. ***J. mexicana***. 1. Ascal apical ring and ascospores, one of which has an asymmetrical sheath. 2. Conidiophores of the ***Libertella***-like synanamorph. 3. Conidia of the ***Libertella***-like synanamorph. 4. Conidiophores of the ***Geniculosporium***-like synanamorph. 5. Conidia of the ***Geniculosporium***-like synanamorph. 6–9. ***J. cinerea***. 6. Ascal apical ring and ascospores. 7. Conidia of the ***Libertella***-like synanamorph. 8. Conidiophores of the ***Geniculosporium***-like synanamorph. 9. Conidia of the ***Geniculosporium***-like synanamorph. The scale bar represents 10 µm.

scars. Conidia produced holoblastically in sympodial sequence. Conidia hyaline, white in dry masses, smooth, ellipsoid to clavate, 4.5–11.5 x 1.5–3 µm, with flattened base indicating former point of attachment to conidiogenous cell.

SPECIMENS EXAMINED: ARGENTINA: Santa Catalina, III.1906, Thaxter, R. 6838 & 6860, dead wood, as ***Hypoxylon griseum*** by Miller, J. H. (GAM 2726 & 2727). BRAZIL: Rick, J., dead branches (GAM 2036, LECTOTYPE [selected here] & GAM 2038, SYNTYPE of ***Nummularia grisea***). MEXICO: San Luis State, Xilitla Municipality, Las Pozas, elev. 585 m, 19.XII.1995, San Martín, F. 5057S (CULTURED), twigs (ITCV; JDR). U.S.A.: Louisiana, near St. Martinsville, 28.III.1890, Langlois, A. B., Fl. Ludoviciana 2278, decorticated wood (NY, HOLOTYPE of ***Hypoxylon cinereum***); Louisiana, Baton Rouge Parrish, Baton Rouge, Burden Farm, 4.III.1985, Glawe, D. A. 85-72, fallen twigs (JDR).

NOTES: The ***Geniculosporium***-like synanamorph has a simple, unbranched or occasionally branched conidiogenous structure which is ephemeral and disintegrates early. The conidiogenous cells do not bear a long, geniculate conidiogenous rachis as do those of ***J. mexicana***.

Miller (1961) cited Rick's specimen no. 226 as the type for ***Nummularia grisea***. We examined this specimen from BPI and its duplicate from the Petrak herbarium in GZU. It was collected in 1923, later than the publication of its basionym, and has a white stromatal surface. This fungus is considered to be a species distinct from ***J. cinerea*** and is described elsewhere herein as ***J. albida***. We also examined another Rick specimen labeled as ***N. grisea*** at BPI [589606] and GZU [Petrak 1452]; it is dated 1906, but, unfortunately, is immature. There are two packets at GAM sent to J. H. Miller by Rick in 1933 who labeled them as type. They contain material of ***J. cinerea***. One of them is selected as the lectotype and ***N. grisea*** is accordingly considered to be synonymous with ***J. cinerea***. ***Hypoxylon cinereum***, ***N. cinerea***, and ***N. grisea*** were considered to be synonyms of ***H. hypophlaeum*** by Miller (1961). Unfortunately, we were unable to locate type material of ***Nummularia cinerea*** at FH.

Jumillera hypophlaea (Berk. & Ravenel) J. D. Rogers, Y.-M. Ju, & San Martín, *comb. nov.*

≡ ***Diatrype hypophlaea*** Berk. & Ravenel *apud* Berk., Grevillea 4: 95. 1876.

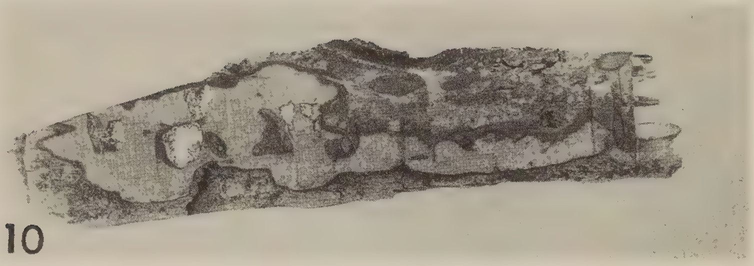
≡ ***Anthostoma hypophlaeum*** (Berk. & Ravenel) Sacc., Syll. Fung. I, p. 306. 1882.

≡ ***Nummularia hypophlaea*** (Berk. & Ravenel) Cooke, Grevillea 12: 7. 1883.

≡ ***Hypoxylon hypophlaeum*** (Berk. & Ravenel) S. Teng, Sinensia 4: 403. 1934.

≡ ***Numulariola hypophlaea*** (Berk. & Ravenel) P. Martin, J. S. African Bot. 35: 292. 1969; [*nom. inval.*, ICBN Art. 33.2]; J. S. African Bot. 42: 77. 1976.

The teleomorph is much as ***J. cinerea*** except for having a dull black mature stromatal surface and slightly narrower ascospores, 7.5–11 x 3.5–4 µm.



10

Fig. 10. ***Jumillera mexicana***. Stroma, X1.25.

SPECIMENS EXAMINED: U.S.A.: South Carolina, Santee Canal, Ravenel, H. W., dead limbs of ***Magnolia glauca***, as ***Sphaeria hypophloea*** B. & R., *ined.* (K 36395, HOLOTYPE of ***Diatrype hypophlaea***); 1855, Ravenel, H. W., Fung. Carol. Fasc. IV, no. 38, corticated wood of ***Magnolia glauca*** (BPI 589617; GZU-Petrak 1455; NY, TYPES? of ***Diatrype hypophlaea***); New Jersey, Newfield, XI.1883, Ellis, J. B., North Am. Fung. ser. II, no. 1554, as ***Nummularia hypophloea*** (GZU-Petrak 1456); New Jersey, Newfield, XI.1883, Ellis, J. B., dead trunks of ***Magnolia glauca***, as ***Nummularia* "*hypophloea*"** (BPI 589616); New Jersey, Newfield, IV.1894, Ellis, J. B., Fungi Columbiani 429, dead ***Magnolia glauca***, as ***Nummularia* "*hypophloea*"** (WSP 4783).

NOTES: This fungus seems to be highly associated with ***Magnolia***.

Jumillera mexicana J. D. Rogers, & Y.-M. Ju, & San Martín, *sp. nov.*

Figs. 1–5, 10

Stromata applanata vel effuso-pulvinata, solitaria vel confluentia, usque ad 7 cm longa x 1–1.6 cm lata x 0.3–0.5 mm crassa, bipartita strato externo brunneo tenui dehiscenti superficiem maturam griseam aperiente; strato carbonaceo sub superficie locato. Textura inter perithecia praecipue e textura hospitis composita et sub perithecia inconspicua. Perithecia ca. 0.2 mm diam. Ostiola punctata. Asci 80–95 μm longitudine tota x 4–5 μm crassi, partibus sporiferis 65–75 μm longitudine, stipitibus 10–20 μm longitudine, annulo apicali in liquore iodato Melzeri cyanescente, discoideo, 0.5 μm alto x 1.5 μm lato. Ascosporae brunneae, unicellulares, ellipsoideo-inaequilaterales apicibus angustatis vel acutis, leves, 7.5–9 x 3.5–4 μm, rima germinativa recta longa in latere convexiore, plerumque vagina reniformi praeditae.

Stromata applanate or effused-pulvinate, solitary or confluent, up to 7 cm long x 1–1.6 cm broad x 0.3–0.5 mm thick, bipartite with thin brown outer layer dehiscent, exposing mature light gray surface; carbonaceous layer immediately beneath surface; the tissue between perithecia mainly composed of host tissue and beneath the perithecia inconspicuous. Perithecia ca. 0.2 mm diam. Ostioles lower than stromatal surface, with ostiolar openings appearing punctate. Asci 80–95 μm total length x 4–5 μm broad, the spore-bearing part 65–75 µm long, the stipe 10–20 µm long, with apical ring bluing in Melzer's iodine reagent, discoid, 0.5 µm high x 1.5 µm broad. Ascospores brown, unicellular, ellipsoid-equilateral, with narrowly rounded to acute ends, smooth, 7.5–9 x 3.5–4 µm, with straight germ slit spore-length on the more convex side, usually enclosed by a reniform hyaline sheath.

Colonies on 2% Difco oatmeal agar incubated at 20°C and 12 h of fluorescent light covering Petri dish in 4–5 wk, at first whitish, velvety, with diffuse margins, becoming greenish olivaceous, zonate. Reverse dull green, becoming blackish. Two synanamorphs produced. ***Libertella***-like synanamorph: Conidium-bearing regions distributed upon concentrically stromatized zones. Conidiophores di- or trichotomously branched, with hyaline to pale brown stipes, smooth-walled, arranged in dense palisades. Conidiogenous cells terminal, cylindrical, smooth, 10–20 x 2–2.5 µm, bearing slightly denticulate secession scars. Conidia produced holoblastically in sympodial sequence. Conidia hyaline, dull amber in slimy masses, smooth, long cylindrical, slightly curved, 9.5–13 x 1–1.5 µm, with flattened base indicating former point of attachment to conidiogenous cell. ***Geniculosporium***-like synanamorph: Conidium-bearing regions sporadic. Conidiophores dichotomously branched, hyaline, smooth-walled. Conidiogenous cells terminal, long cylindrical, smooth, 20–60 x 2–3 µm, bearing poroid secession scars. Conidia produced holoblastically in sympodial sequence. Conidia hyaline, white in dry masses, smooth, ellipsoid, 4.5–5.5 x 2.5–3 µm, with flattened base indicating former point of attachment to conidiogenous cell.

SPECIMEN EXAMINED: MEXICO: San Luis State, Valles Municipality, Taninul Hotel, elev. 102 m, 18.XII.1995, San Martín, F. 5041S (CULTURED), decorticated wood (ITCV, HOLOTYPE; WSP, ISOTYPE of ***Jumillera mexicana***).

NOTES: This is the only known taxon of ***Jumillera*** with conspicuously inequilateral ascospores that are enclosed by a hyaline sheath. The colony morphology is highly similar to that of *J. **viridis*** as described by Ju et al. (1993), especially in producing concentric zones.

Jumillera punctatobrunnea (Theiss.) J. D. Rogers, Y.-M. Ju, & San Martín, *comb. nov.*

≡ ***Nummularia punctatobrunnea*** Theiss., Ann. Mycol. 6: 348. 1908.

The teleomorph is much as *J. **cinerea*** except for having a dull brown mature stromatal surface and slightly narrower ascospores 7–9 x 3–4 µm.

SPECIMENS EXAMINED: Rio Grande do Sul, São Leopoldo, Theissen, F., Dec. Fung. Brasil. 82, corticated branches (BPI 589566, SYNTYPE of ***Nummularia punctatobrunnea***); 1929, Rick, J. 391, as ***Nummularia punctatobrunnea*** (GZU-Petrak 1466).

NOTES: This fungus seems typical of a ***Jumillera***. Unfortunately, cultures are lacking.

Jumillera viridis (Theiss.) J. D. Rogers, Y.-M. Ju, & San Martín, *comb. nov.*

≡ ***Nummularia viridis*** Theiss., Ann. Mycol. 6: 350. 1908.

The teleomorph is in general similar to ***J. cinerea*** except for the greenish or olivaceous tan colors of the mature stromatal surface. See Ju et al. (1993) for a brief description, including cultures and anamorph.

SPECIMENS EXAMINED: BRAZIL: São Leopoldo, III.1908, Rick, J., corticated wood, as ***Nummularia viridis*** (S). MEXICO: Nuevo León, Santiago, El Cercado, 16.IV.1988, San Martín, F. 428 (CULTURED), branches of ***Quercus***, as "***Nummularia***" *sp*. (ITCV; JDR).

NOTES: Ju et al. (1993) obtained a ***Libertella***-like anamorph from this fungus [as "***Nummularia***" *sp*.]. We were unable to locate the type of ***N. viridis***. The above-cited Rick collection is authentic material from the type locality and fits the protologue well. Miller (1961) treated ***N. viridis*** as a synonym of ***Hypoxylon hypophlaeum***.

Whalleya J. D. Rogers, Y.-M. Ju, & San Martín, *gen. nov.*

Etymology: For our distinguished colleague and friend, Anthony J. S. Whalley.

A ***Biscogniauxia*** differt in textura molli alba inter perithecia et in statu conidico cum scolecosporis siccis.

Differs from ***Biscogniauxia*** in soft white tissue between perithecia and in the conidial state with dry scolecospores.

Type species: ***W. microplaca*** (Berk. & M. A. Curtis) J. D. Rogers, Y.-M. Ju, & San Martín

Stromata applanate, solitary or confluent, lacking KOH-extractable pigments; outer dehiscing layer dark brown, thin, exposing mature black surface; carbonaceous tissue immediately beneath surface; the tissue between perithecia mainly composed of fungal tissue, coriaceous, white, becoming brownish; the tissue below the perithecial layer inconspicuous. Perithecia globose, monostichous. Ostioles lower than the level of stromatal surface and appearing punctate on the stromatal surface. Asci eight-spored, cylindrical, short-stipitate, persistent, with apical ring discoid, amyloid. Ascospores light brown, unicellular in both mature and immature ascospores, ellipsoid-inequilateral, with narrowly rounded ends, with straight germ slit; perispore indehiscent in 10% KOH; epispore smooth.

Anamorph ***Geniculosporium***-like, but with denticulate conidial secession scars and scolecosporous conidia.

NOTES: Both ***Whalleya*** and ***Jumillera*** produce scolecosporous conidia. The scolecosporous conidia produced by ***Whalleya*** differ from those of ***Jumillera*** mainly in being dry and in being borne on hyphomycetous conidiophores. Unlike most collections of ***Jumillera***, ***Whalleya*** has the space between perithecia filled primarily with fungal tissue.

Whalleya microplaca (Berk. & M. A. Curtis) J. D. Rogers, Y.-M. Ju, & San Martín, *comb. nov.*

≡ ***Diatrype microplaca*** Berk. & M. A. Curtis, J. Linn. Soc., Bot. 10: 386. 1869.

≡ ***Anthostoma microplacum*** (Berk. & M. A. Curtis) Sacc., Syll. Fung. I, p. 298. 1882.

≡ ***Nummularia microplaca*** (Berk. & M. A. Curtis) Cooke, Grevillea 12: 8. 1883.
≡ ***Hypoxylon microplacum*** (Berk. & M. A. Curtis) J. H. Miller, Mycologia 33: 77. 1941.
≡ ***Numulariola microplaca*** (Berk. & M. A. Curtis) P. Martin, J. S. African Bot. 35: 299. 1969.
= ***Nummularia scutata*** Berk. & Cooke *apud* Cooke, Grevillea 12: 7. 1883.
= ***Nummularia gracilenta*** Syd. & P. Syd., Ann. Mycol. 8: 37. 1910.
= ***Nummularia lamprostoma*** Syd. & P. Syd., Ann. Mycol. 18: 99. 1920. *Fide* Miller (1961).

Ascospores 4–6(–7) x 2–3(–4) μm. See Miller (1961) for a description of teleomorph. See Jong and Rogers (1972) and Glawe and Rogers (1986) for descriptions of cultures and anamorph.

SPECIMENS EXAMINED: CHINA: Yunnan, Yen-tsin, 5.IV.1934, Tsiang, Y. 886, wood , as ***Nummularia hypophloea*** (GZU-Petrak 1457). MAURITIUS: twigs of ***Magnolia glauca*** (K 32213, HOLOTYPE of ***Nummularia scutata***). PHILIPPINES: Dumaguete, (Cuernos Mts.), prov. Negros Orient., III.1908, Elmer, A. D. E. 9684, wood (GZU-Petrak; WSP 29016, TYPES of ***Nummularia gracilenta***). U.S.A.: Florida, Dade Co., Snapper Creek, 1.III.1944, Rhoads, A. S., wood of ***Persea***, as ***Nummularia microplaca*** by Shear, C. L. (GZU-Petrak 1462); Louisiana, 26.XII.1885, Langlois, A. B., wood of ***Melia***, as ***Nummularia microplaca*** (GZU-Petrak 1473); Virginia, Dead Run, 30.V.1899, Shear, C. L., Ellis & Everhart's Fungi Columbiani (continued by C. L. Shear) 1419, dead ***Sassafras officinale***, as ***Nummularia microplaca*** (WSP 4785).

Whalleya maculata (Theiss.) J. D. Rogers, Y.-M. Ju, & San Martín, *comb. nov.*
≡ ***Nummularia maculata*** Theiss., Ann. Mycol. 6: 348. 1908.
≡ ***Hypoxylon maculatum*** (Theiss.) J. H. Miller, Monogr. of the World Species of ***Hypoxylon***, p. 128. 1961.
≡ ***Numulariola maculata*** (Theiss.) P. Martin, J. S. African Bot. 35: 293. 1969; [*nom. inval.*, ICBN Art. 37.1]; J. S. African Bot. 42: 78. 1976.

Ascospores 5–7 x 2–4 μm. See Miller (1961) for a description of the teleomorph.

SPECIMENS EXAMINED: BRAZIL: Itaicy, 23.XI.1957, Torrend, C. 8917, wood, as ***Nummularia ovata*** Torrend, *ined.* (WSP 48723); Rio Grande do Sul, São Leopoldo, Theissen, S. J., Dec. Fung. Brasil. 116 [= Rehm's Ascomyc. 1913], corticated branches (BPI 589563; W 1062, SYNTYPES of ***Nummularia maculata***); São Leopoldo, 1907, Theissen, F., Rick's Fung. Austro-Amer. 308, corticated branches (BPI 590089; GZU-Petrak 1460, SYNTYPES of ***Nummularia maculata***); Rick, J., corticated wood (GAM 2933, TYPE of ***Nummularia maculata***); Rick, J., wood, as ***Nummularia maculata*** (GZU-Petrak 2130); Theissen, F., wood, as ***Nummularia clypeus*** *var.* ***macrospora*** (FH). MAURITIUS: O'Connor, C. A., wood, as ***Nummularia maculata*** (GZU-Petrak 2131).

NOTES: ***Nummularia maculata*** differs from ***W. microplaca*** in having larger perithecia and in lacking a specificity for lauraceous and myrtaceous hosts. Miller (1961) considered ***Nummularia punctatobrunnea*** to be a synonym, but we consider this to be a distinct species of ***Jumillera***.

ACKNOWLEDGEMENTS

PPNS No. 0246, Department of Plant Pathology, Project 1767, Washington State University, College of Agriculture and Home Economics. This study was supported in part by National Science Foundation Grant DEB-9500503 to JDR and CONACYT and Sistema Nacional de Investigadores de Mexico grants to FSM. We thank herbaria BPI, FH, GAM, GZU, K, NY, S, and W for loaning specimens and searching for material. We thank Donald P. Rogers, Auburn, WA, for editing the Latin descriptions. We thank Michael J. Adams, Washington State University, for aid with photography. We thank Lori M. Carris, Washington State University, and Liliane Petrini, Comano, Switzerland for reading the manuscript.

LITERATURE CITED

Glawe, D. A., and J. D. Rogers. 1986. Conidial states of some species of Diatrypaceae and Xylariaceae. Canad. J. Bot. 64: 1493–1498.

Granmo, A., and L. E. Petrini. 1996. A new species of ***Lopadostoma***, and the anamorph of ***Biscogniauxia cinereolilacina***. Mycologia Helv. 8: 43–50.

Jong, S.-C., and J. D. Rogers. 1972. Illustrations and descriptions of conidial states of some ***Hypoxylon*** species. Wash. State Agric. Exp. Sta. Bull. 71. 51 pp.

Ju, Y.-M., F. San Martín González, and J. D. Rogers. 1993. Three xylariaceous fungi with scolecosporous conidia. Mycotaxon 47: 219–228.

Kenerley, C. M., and J. D. Rogers. 1976. On ***Hypoxylon serpens*** in culture. Mycologia 68: 688–691.

Miller, J. H. 1961. A monograph of the world species of ***Hypoxylon***. Univ. Georgia Press, Athens. 158 pp.

Rappaz, F. 1995. ***Anthostomella*** and related xylariaceous fungi on hard wood from Europe and North America. Mycologia. Helv. 7: 99–168.

MYCOTAXON

Volume LXIV, pp. 51-55 September 1997

TWO NEW SPECIES OF *TRANZSCHELIA* (UREDINALES) ON PRUNOIDEAE (ROSACEAE) FROM IRAN

M. Abbasi
Plant Pests and Diseases Research Institute,
P.O. Box 1454, Tehran 19395, Iran

Halvor B. Gjærum
Planteforsk
Norwegian Crop Research Institute
N-1432 Ås, Norway

Summary

Two *Tranzschelia* species are described as new, viz. *T. hyrcanica* sp. nov. on *Prunus divaricata* subsp. *caspica* and *T. iranica* sp. nov. on *Cerasus microcarpa* subsp. *microcarpa*, both from Iran. Included is a key to the species of *Tranzschelia* in Iran.

Introduction

According to the literature six species of *Tranzschelia* are previously known on Prunoideae (Rosaceae), viz. *T. arthurii, T. discolor, T. japonica, T. microcerasi, T. ornata* and *T. pruni-spinosae* (Dunegan 1938, Tranzschel & Litvinov 1939, López-Franco & Hennen 1990).

T. pruni-spinosae has been reported several times as the causal agent of rust on Prunoideae in Iran by Iranian and foreign mycologists (Ershad 1995). Recent studies have revealed that *T. discolor* is the main causal agent on Prunoideae in Iran, especially on cultivated stone fruit species, and the existence of *T. pruni-spinosae* in Iran is doubtful. Moreover *T. microcerasi* has been reported as the causal agent of rust on some non-cultivated stone fruits in Iran (Abbasi & Ershad 1995).

In this paper two new species of *Tranzschelia*, viz. *T. hyrcanica* sp. nov. and *T. iranica* sp. nov., are described on stone fruits from Iran.

Material and methods

The material presented in this paper was either collected by the first mentioned author from several parts of Iran or picked out from herbarium sheets, mostly from Herbarium Ministrii Iranici Agriculturae (IRAN), and a few also from the Herbarium of the Botanical Institute of Iran, Tehran (TARI) (Fig. 1). Spore measurements were made on spores mounted in lactophenol. For scanning microscopy (SEM) dry spores were mounted on specimen stubs, coated with gold, 3-3.5 min in 29mA.

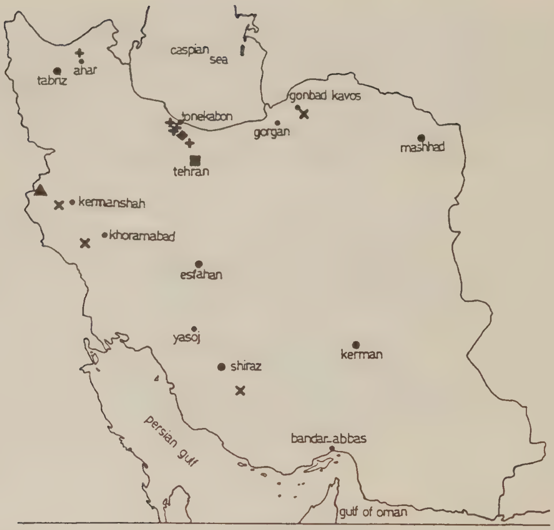


Fig. 1. ◆ locus classicus of *T. hyrcanica*

▲ locus classicus of *T. iranica*

✚ localities of paratype specimens of *T. hyrcanica*

✖ localities of paratype specimens of *T. iranica*

Tranzschelia hyrcanica Abbasi & Gjærum sp. nov. (Fig. 2).

Spermogonia et aecia ignota. Uredinia hypophylla, cinnamomea, pulverulenta, in maculis parvis flavis vel brunneis dispersa, cum paraphysibus capitatus, spathulatis vel clavatis, pariete hyalino vel flavo-brunneo, 1 µm crasso, ad apicem saepe usque 1.5 µm incrassato. Urediniosporae 23-34 (-39) x 17-21 (-23) µm, obovoideae vel late fusiformes, pariete lateralis pallide flavo-brunneo, 1,5 µm crasso, ad apicem flavo-brunneo, usque 3.5-8.5 µm incrassato, echinulatae, echini basin versus conspicui, ad apicem brevescens et parvescens, poris 3-6 equatorialibus instructis. Telia uredinia similes, sed fusca. Teliosporae 31-58 x 18-27(-30) µm, fasciculatae, obovoideae, oblongo-obovoideae vel ellipsoideae, ad septum constrictae, cellula superioris ellipsoidea, oblongo-globoidea vel fere globoidea, pariete 2.5 µm crasso, cellula inferioris clavoidea, obovoidea vel fere globoideae, plerumque dilutior quam cellula superioris, pariete 2.5 µm crasso, equalis ambae cellulae, valde echinulato, poro superiore apicali vel subapicali, poro inferiore equatoriale vel prope pedicellum, pedicelli usque 1.5 µm longi, hyalini, tenues, basi aggregata.

Spermogonia and aecia not seen. Uredinia hypophyllous, cinnamon-brown, pulverulent, scattered on small, yellow or brown spots, with hyaline or yellowish-

brown, capitate, spathulate or clavate paraphyses, wall 1 µm thick, apically often thickened up to 1.5 µm. Urediniospores 23-34(-39) x 17-21(-23) µm, obovoid or broadly fusiform, wall yellowish-brown above, paler below, 1.5 µm thick at sides, 3.5-8.5 µm apically, echinulate, echinulae conspicuous towards the base of the spore, becoming shorter and smaller upwards, with 3-6 equatorial pores. Telia similar to the uredinia, but blackish brown. Teliospores 31-58 x 18-27 (-30) µm, developing in fascicles, obovoid, oblong-ovoid, or ellipsoid, constricted at septum. The upper cell ellipsoid, oblong-globoid or almost globoid, brown, the lower cell clavoid, obovoid or almost globoid, usually paler than the upper cell, wall in both cells equally 2.5 µm thick, roughly echinulate, upper pore apical or subapical, lower pore equatorial or near the pedicel. Pedicel up to 15 µm long, hyaline, thin, basically attached in groups.

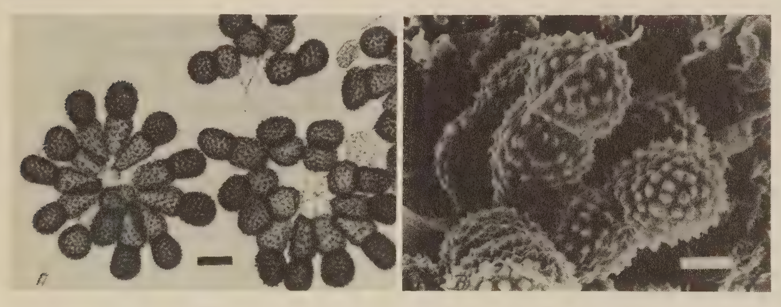


Fig. 2. *Tranzschelia hyrcanica*, teliospores from type.
(Bar: A - 20 µm, B - 10 µm).

Holotype: Iran, Kelardasht, Roudbarak towards Vandarbon, 4 km SW of Roudbarak, 1680 m, on *Prunus divaricata* Ledeb. subsp. *caspica* (Kov. & Ekim.) Browicz, 20.08.1992, leg. M. Abbasi & J. Fatehi, 8605 (IRAN). Isotype in NPPI.

Other specimens examined:

On *Prunus divaricata* Ledeb.: Iran, Mazandaran, Ramssar, Javaher-deh road, 03.10.1994, M. Abbasi & A.A. Moini, 9334 (IRAN), II + III.

On *P. divaricata* subsp. *divaricata*: Iran, Azerbaijan, W of Kaleybar, Zyveh village, 1400 m, 10.10.1983, Mozaffarian, 9335 (IRAN), (II) + III.

On *P. spinosa* L.: Iran, Chalus road, Siah-Bisheh, around the road 2000 m, 05.10.1994, M. Abbasi and A.A. Moini, 9332 (IRAN) (II) + III; Mazandaran, Tonekabon, Do-Hezar area, Yaghi-Dasht road 1300 m, 04.10.1994, M. Abbasi and A.A. Moini, 9331 (IRAN), (II) + III.

On *Prunus* sp.: Iran, Mazandaran, between Tonekabon and Ramssar, Janat-Roodbar road, after Dalikhani spring, Vaposhteh forest, 1450 m, 18.07.1993, M. Abbasi, B. Daneshpazhuh and A. Karavar, 9333 (IRAN), (II) + III.

Except the specimen collected at Kalybar, they were all collected in the Hyrcanian area in the north of Iran (Fig. 1).

Tranzschelia iranica Abbasi & Gjærum, sp. nov. (Fig. 3).

Spermogonia et aecia ignota. Uredinia hypophylla, cinnamomea, pulverulenta, dispersa vel confluentia, in maculis angularibus, flavis vel brunneis cum paraphysibus spathulatis vel capitatis, hyalinis vel pallide flavis pariete 1 µm crasso, ad apicem usque 1.5 µm incrassato. Urediniosporae 22-36 (-40) x 12-18.5 µm, obovoideae, oblongo-clavatae, oblongo-fusiformes vel clavatae, pariete lateris 1-1.5 µm crasso, ad apicem usque 5 µm incrassato, basi echinulatae, ad apicem leves, poris 3-4 equatorialibus instructis. Telia hypophylla, fusca. Teliosporae 30-54 x 20-29 µm, fasciculatae, oblongo-ovoideae vel obovoideae, pariete ad apicem usque 7 µm incrassato, dense et grosse echinulatae, fusco-castaneae, cellula inferioris oblongo-elliptica, pariete ad equatorem 3-5 µm crasso, dilutior et echinis minores quam cellulae superioris, amba pori prope septum, pedicelli usque 43 µm longi, tenues, hyalino, basi aggregati.

Spermogonia and aecia not seen. Uredinia hypophyllous, cinnamon, pulverulent, scattered or confluent in small, angular, yellowish to yellowish-brown spots, paraphysate. Paraphyses spathulate to capitate, hyaline to pale yellow, wall 1 µm thick apically up to 1.5 µm thick. Urediniospores 22-36(-40) x 12-18.5 µm, wall 1-1.5 µm thick at the sides, apically thickened up to 5 µm, echinulate at the base, apically smooth with 3-4 equatorial germpores. Telia hypophyllous, blackish brown. Teliospores 30-54 x 20-29 µm, fasciculate, ovoid-oblong or obovoid, wall apically up to 7 µm thick, densely and coarsely echinulate, dark chestnut brown, the lower cells oblong-elliptic, wall 3-5 µm equatorially, paler and less stronger echinulate than the upper cells, pores in both cells at septum, pedicel up to 43 µm long, thin, hyaline, basically attached in goups.

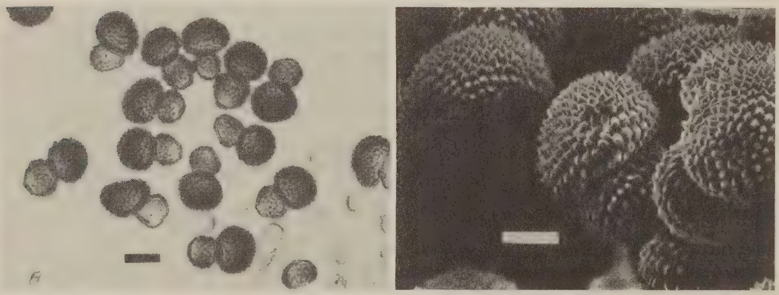


Fig. 3. *Tranzschelia iranica*, teliospores from type.
(Bar: A - 20 µm, B - 10 µm).

Holotype: Iran, Kermanshah, Rijab, Sarab-e Eskandar, on *Cerasus microcarpa* (C.A. Mey) Boiss. subsp. *microcarpa*, 22.06.1968, M. Iranshahr and A. Dezfulian, 5686 (Iran). Isotype in NPPI.

Other specimens examined:
On *Amygdalus* sp.: Iran, Gorgan, Minoodasht, 14.05.1948, Gh. Scharif, 3980 (IRAN), II + III. *Amygdalus* sp., Khafr, ?, Z. Banihashemi, 9336 (IRAN), II + III.
On *Cerasus microcarpa* subsp. *tortuosa* (Boiss. & Haussskn.) Browicz: Iran, Lurestan, 115 km SW Khoramabad, 800 m, 16.06.1959, H. Pabot, 9337 (IRAN), (II) + III. Kermanshah, 39 km SW Kermanshah, 1600 m, 14.06.1959, H. Pabot, 9338 (IRAN), II + III. Specimens of this species has been collected from the north, west and south-western parts of Iran (Fig. 1).

Key to the species of *Tranzschelia* on Prunoideae in Iran, based on teliospore characters.

1. Teliospores not thickened apically	*T. hyrcanica*
1. Teliospores thickened apically	2
2. Upper germpore apical or nearly so, the lower near septum	*T. microcerasi*
2. Both germ pores near septum	3
3. Teliospores up to 44 µm long, apically thickened to 3-4(-5) µm	*T. discolor*
3. Teliospores up to 54 µm long, apically thickened to (4.5-)5-7 µm	*T. iranica*

Acknowledgements

The authors are indebted to Professor D.M. Henderson, Gairloch, Ross-shire, Scotland, for reading and correcting the manuscript, to Dr. N. Shahraeen, Plant Pest and Diseases Research Institute, Tehran, for technical assistance in making the SEM photographs, and to Mrs. Rannveig Ødegaard, Planteforsk, Ås, for typing the manuscript.

References

Abbasi, M. and Ershad, D. 1995. A revision of *Tranzschelia* species occurring on stone fruit trees in Iran. - Iran. J. Plant Path. 31: 69-76.

Dunegan, J.C. 1938. The Rust of stone fruits. - Phytopathology 28: 411-427.

Ershad, D. 1995. Fungi of Iran. - Agricultural Research, Education and Extension Organization, Publication No. 10, Tehran, 874 pp.

Tranzschel, W. and Litwinow, M. 1939. Die Rostpilze aus der Gattung *Tranzschelia* auf den Prunoideen. - Journal de Botanique 24: 247-253 (in Russian with German summary).

López-Franco, R.M. and Hennen, J.F. 1990. The Genus *Tranzschelia* (Uredinales) in the Americas. - Systematic Botany 15: 560-591.

MYCOTAXON

Volume LXIV, pp. 57-66 September 1997

FULVISPORIUM, A NEW GENUS OF USTILAGINALES *

K. VÁNKY, R. BAUER and D. BEGEROW

Universität Tübingen, Botanisches Institut, Spezielle Botanik und Mykologie.
Auf der Morgenstelle 1, D-72076 Tübingen, Germany

ABSTRACT

A new, monotypic genus, *Fulvisporium* K. Vánky is described, based on *Tolyposporium restifaciens* D. E. Shaw (type on *Stipa aristiglumis* F. Mueller, Australia). Its sorus- and spore morphology, ultrastructure of the septal pore and host-parasite relationship, as well as molecular biological characters are described. *Fulvisporium* is compared with *Tolyposporium, Sorosporium, Thecaphora, Aurantiosporium* and *Tolyposporella.*

Key words: Ustilaginales, *Fulvisporium*, *Fulvisporium restifaciens*, morphology, ultrastructure, molecular phylogeny, rDNA.

INTRODUCTION

A peculiar smut fungus, "ropy smut", was described from Australia, on *Stipa aristiglumis* F. Mueller, under the name of *Tolyposporium restifaciens* D. E. Shaw (1952:145), producing light coloured, permanent spore balls in the culms of the host plants. Mature sori resemble twisted, teased-out ropes. Discussing the generic affinity of this smut fungus, Shaw (1952:144) compared it with *Tolyposporium* and *Thecaphora* and remarked that "The organism does not conform entirely to either genus". Indeed, most of the characters of this fungus do not fit either with those of *Tolyposporium* or with any other known genus (comp. Vánky, 1987). The ultrastructural and molecular biological results rather show a relationship to the *Microbotryum* group than to the *Tolyposporium* or *Thecaphora* species.

---

* Part 139 in the series "Studies in Heterobasidiomycetes" from the Botanical Institute, University of Tübingen.

MATERIALS AND METHODS

Smutted plants of *Stipa stuposa* Hughes were collected in Australia (Tasmania, Hobart, Queen's Domain, 5.III.1996, C. & K. Vánky), pressed and dried. Material used for studies of the sorus structure, spore morphology, spore germination and molecular biological analysis was taken from these specimens, preserved in the senior author's herbarium (Herb. Ustil. Vánky, HUV 17637) and in the Tasmanian Herbarium, Hobart (HO). Further specimens, used for molecular analysis are: *Aurantiosporium subnitens* (Schröter & P. Henn.) Piep., K. Vánky & Oberw. on *Scleria pratensis* Lindley ex Nees (Herb. M. Piepenbring 1173, = HUV 17125), *Thecaphora seminis-convolvuli* (Desm.) Ito on *Convolvulus arvensis* L. (Herb. A. Nagler 775), *Tolyposporella brunkii* (Ell. & Gall.) G. P. Clinton on *Andropogon saccharoides* Swartz (HUV 17816), and *Tolyposporium junci* (Schröter) Wor. on *Juncus bufonius* L. (HUV 17169).

For light microscopical (LM) studies, dried spores were rehydrated in lactophenol by gently heating to the boiling point. For scanning electron microscopical (SEM) studies, dried spores were dusted on double-sided adhesive tape, mounted on specimen stub, sputter-coated with gold-palladium, ca. 20 nm, and examined in a SEM at 10 kV.

For the study of germination, spores were spread thinly on water agar (WA) and on malt yeast peptone agar (MYP), in Petri dishes, kept at room temperature (ca. 22 °C). As soon as basidiospores were produced, a suitable piece of medium (about 10 mm square) was cut out, transferred to a slide, and covered with a coverglass. A small droplet of lactophenol with cotton blue, added to the side of the square of medium, fixed and stained the basidia and basidiospores.

For studies of the soral and ultrastructural characters, fresh material was fixed with 2% glutaraldehyde in 0.1 M Na-cacodylate buffer at pH 7.2 for several days. After six transfers in 0.1 M Na-cacodylate buffer, the material was postfixed in 1% osmiumtetroxide in the same buffer for 1 h in the dark, washed in distilled water, and stained in 1% aqueous uranyl acetate for 1 h in the dark. After five washes in distilled water, the material was dehydrated in acetone series, embedded in Spurr's plastic and sectioned with a diamond knife. Semi-thin sections were stained with new fuchsin and crystal violet, mounted in "Entellan" and studied in a light microscope (LM). Ultra-thin sections were mounted on copper-slot-grids, post-stained with lead citrate for 5 minutes, and examined in a transmission electron microscope (TEM) at 80 kV.

For molecular biological studies, DNA was isolated from herbarium material or from culture obtained from germinated spores, using the SDS method of Edwards et al. (1991) modified by Henrion et al. (1992). The 5' region of the nuclear large subunit ribosomal RNA gene was amplified using the polymerase chain reaction and the primers NL1 and NL4 (Boekhout et al., 1995). The PCR product was purified using the QIAquick™ protocol (QIAGEN). This dsDNA was sequenced directly using the ABI PRISM™ Dye-Termination Cycle Sequencing Kit (Perkin Elmer) on an automated sequencer (ABI 373, Perkin Elmer). An alignment of 551 bp was obtained using ClustralW program (Thompson et al., 1994). The sequence data were analysed by PHYLIP, version 3.5c (Felsenstein, 1993).

RESULTS

The study of the sori, spore balls, spores and spore germination of *Tolyposporium restifaciens*, complemented by ultrastructural and molecular biological characters, revealed that this smut fungus cannot be placed in any earlier known genus. Therefore a new genus is proposed for it:

Fulvisporium K. Vánky, **gen. nov.**

Sori in telis vegetativis Graminearum glomerulos intercellulares sporarum formantes. Peridium nullum, columella nulla, greges sporarum sterilium inter glomerulos sporarum nulli. Glomeruli sporarum permanentes, tenuiter colorati, e sporis tantum compositi. Germinatio sporarum secundum typum *Ustilago*.

Sori in vegetative tissues of Gramineae in which intercellularly spore balls are produced. No peridium, no columella, no groups of sterile cells between the spore balls. Spore balls permanent, poorly pigmented, composed only of spores. Spore germination of *Ustilago*-type. Typus generis:

Fulvisporium restifaciens (D. E. Shaw) K. Vánky, **comb. nov.**

Basionym: *Tolyposporium restifaciens* D. E. Shaw, Proc. Linn. Soc. New South Wales 77:145, 1952. – Type on *Stipa aristiglumis* F. Mueller, Australia, New South Wales, Breeza Plains, 10.XII.1951, G. Dickson. Holotype in SYD (693), isotype in IMI (47686).

Sori (Figs. 1, 2) in the stems, in the distal internode(s), when mature resembling twisted, teased-out ropes, 0.5–1 cm wide, 20–50(–90) cm long, consisting of vascular bundles, whereas the intervascular parenchymatous tissue is destroyed and replaced by a yellowish-brown, when older light cinnamon-brown, granular powdery mass of spore balls. Spore balls (Figs. 3, 4, 6) subglobose, broadly ellipsoidal, ovoid, often elongated or slightly irregular, (10–)13–32 x (12–)16–40(–55) µm, golden-yellow to pale yellowish-brown, translucent, composed of (1–)5–25 (or more?) firmly united spores. Spores (Figs. 3, 4, 6) variable in shape and size, rounded with flattened contact sides, from ovoid, ellipsoidal, elongated, hemiglobose to subpolyhedrally irregular, 6–12(–13) x 8–14(–16) µm, pale golden-yellow; wall smooth, 1–2(–3) µm thick, thinner on the contact sides, thicker at the angles. In the centre of the free surface the exospore is thin forming a ca. 2 µm wide, round germ pore which in rehydrated spores slightly protrude forming a small papilla (Fig. 3, arrows), in dehydrated spores is depressed (Fig. 6, arrow). In young stages, sporogenous hyphae are growing intercellularly in the parenchyma tissue of the stem. Later, between the parenchyma cells, thin-walled, hyaline, spore ball initials are formed which increase in size, become thick-walled and slightly pigmented (Figs. 2, 5). At maturity, the epidermis ruptures releasing the spore masses. The remaining, naked vascular bundles give to the old sori the appearance of a teased-out rope. Spore germination (Fig. 8; of 6 weeks old spores, on water agar (WA) or on malt yeast peptone agar (MYP), at room temperature, after 1 day) results in 4-celled basidia measuring 2–3(–4) x 15–25(–28) µm. On the basidia, laterally and terminally, ovoid or long-ellipsoidal basidiospores of 1.5–2 x 4–8 µm are produced directly, without sterigmata. The septa separating two fungal cells (Fig. 7) show typical basidiomycetous substructure: two outer electron-opaque

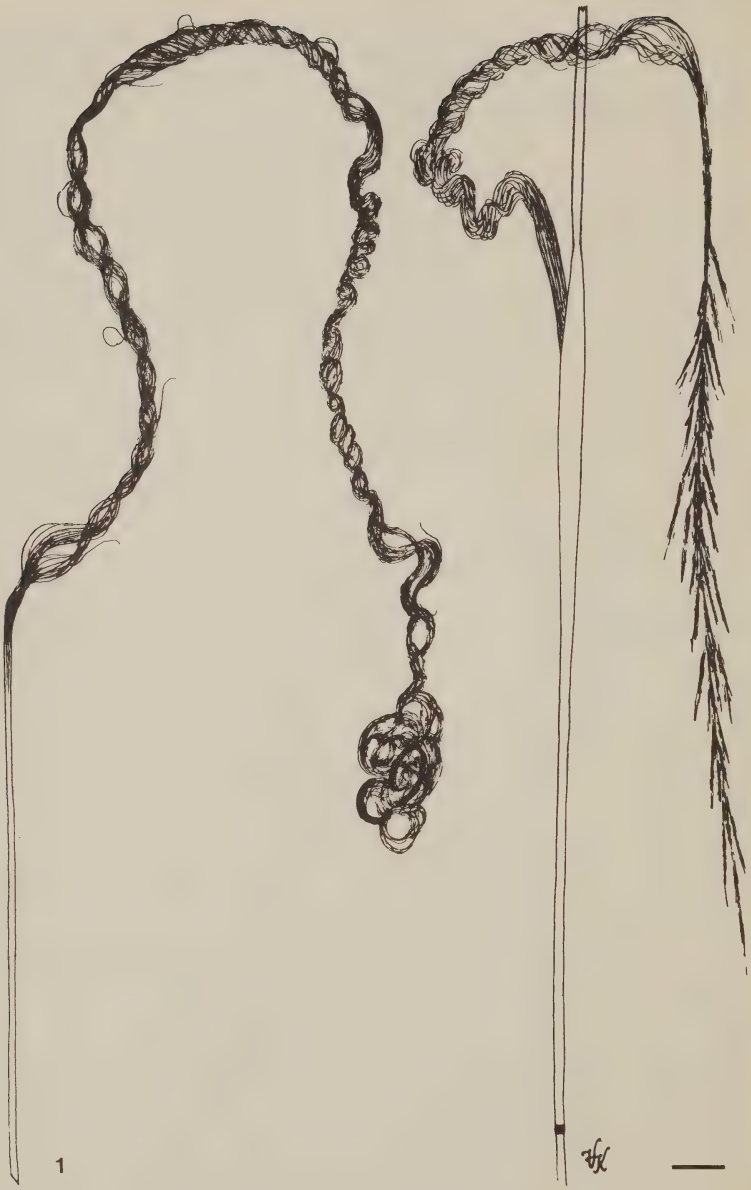


Fig. 1. Sori of *Fulvisporium restifaciens* (D. E. Shaw) K. Vánky on the culms of *Stipa stuposa* Hughes (Vánky, Ust. exs. No. 414). Bar = 1 cm

layers are separated by a thin electron-transparent middle lamella (Fig. 7, arrow). The septal wall tapers towards the pore lip, without flaring. The septal pore is simple (Fig. 7, arrow head). The pore canal is small, occasionally occluded by electron-opaque material.

On Gramineae: *Stipa aristiglumis* F. Mueller, *S. blackii* C. E. Hubb., *S. stuposa* Hughes, and *Stipa* sp., Australia [N.S.W., Tas.].

DISCUSSIONS

Tolyposporium species [type *Tol. junci* (Schröter) Woronin ex Schröter on *Juncus bufonius* L.] are parasitising members of the Cyperaceae and Juncaceae families. The spore balls are produced on the surface of the host tissue, most commonly on the internal floral organs (gynoeceum, filaments), rarely on the floral envelopes and pedicels. The parasitic hyphae are intracellular. The spore balls are differentiating within a mass of sporogenous hyphae, closest to the host tissues and the ripening is centrifugal. The spore mass is black, the spore balls are blackish-brown to opaque.

In contrast, *Fulvisporium restifaciens* is parasitising members of the Gramineae family. The spore balls are produced within the culm tissues and are liberated after the covering host tissues are ruptured. The parasitic hyphae are intercellular. There is no mass of sporogenous hyphae in which the spore balls are differentiating. The spore mass is yellowish-brown, the spore balls are golden-yellow to pale yellowish-brown, translucent. The phragmobasidial type of spore germination has *Fulvisporium* in common with *Tolyposporium* species.

Species of *Sorosporium* [type: *S. saponariae* Rudolphi] and *Thecaphora* [type: *Thec. hyalina* Fingerh. = *Thec. seminis-convolvuli* (Desm.) Ito] are parasitising members of a great number of dicots families. They are producing more or less permanent, pigmented spore balls in various organs of the host plants. The parasitic hyphae are intracellular. The spore balls are differentiating from grouped, coiled sporogenous hyphae. The spore mass is light yellowish- to dark reddish-brown. The type of germination (where it is known) is different from that of *Fulvisporium restifaciens*, and usually results in production of one to several, ovoid or long ellipsoidal, aerial "conidia" on the top of shorter or longer hyphae or hyphal branches (comp. Ingold, 1987:473 + Fig. 2; Nagler, 1986:56-60 + Figs 26-27).

Aurantiosporium [type: *A. subnitens* (Schröter & Hennings) Piepenbring, K. Vánky & Oberwinkler], on a member of the Cyperaceae family (*Scleria melaleuca* Reichb. ex Schldl. & Cham.), is producing parenchymatous galls in some of both male and female spikelets of an inflorescence. The sori are filled with orange to cinnamon coloured spore masses composed of light- to orange-yellow spores, single or aggregated into irregular groups of easily separating "pseudo spore balls" held together by a thin, gelatinous spore sheath. The parasitic hyphae are intercellular. The septal pore is simple. Spore germination results in phragmobasidia. These characters bring *Aurantiosporium* and *Fulvisporium* close to each other. The main differentiating character between these two genera is the presence of firm, permanent spore balls in *Fulvisporium* in contrast to single spores or spores adhering in loose groups in *Aurantiosporium*. The host plants also belong to different families.

Tolyposporella is an insufficiently known, small, apparently heterogeneous genus. Its type [*T. chrysopogonis* Atkinson on *Sorghastrum nutans* (L.) Nash., Gramineae] is characterised by sori on the inner surface of the leaf sheaths forming more or less confluent, at first subepidermal, later bursting striae filled with a black, granular-agglutinated mass of spore balls composed of a great number of apparently loose but firmly agglutinated spores (illustrated by Vánky, 1987:115). The exospore is irregularly thickened (2.5–8, rarely up to 14 µm), laminated, smooth. Spore germination (Atkinson, 1897:16) "by a delicate promycelium which becomes branched, septate. Sporidia borne laterally, single, subclavate or fusoid, 2–2.5 x 9–12 µm". *Tolyposporella chrysopogonis* has intercellular hyphae and no simple septal pore. The pigmented spores with a peculiar morphology (due to the irregularly thickened exospore), the type of spore germination (illustrated by Thirumalachar, Whitehead & O'Brien, 1967:392), the lack of simple septal pore differentiate *Tolyposporella* from *Fulvisporium restifaciens*.

Among the smuts, *Fulvisporium restifaciens* shares the combination of presence of phragmobasidia and absence of intracellular hyphae only with *Microbotryum* (sensu Bauer & Oberwinkler), *Liroa, Sphacelotheca, Ustilentyloma* and *Aurantiosporium*. As in *F. restifacines*, the septa in *Ustilentyloma* and *Aurantiosporium* possess simple pores, whereas they are poreless in *Microbotryum*, *Liroa* and *Sphacelotheca*. Thus, the ultrastructural characteristics indicate that *Fulvisporium restifaciens* is closely related to *Ustilentyloma* and *Aurantiosporium*. Of these genera *Ustilentyloma* has single spores, *Aurantiosporium* also single spores but often aggregated into irregular, easily separating groups (pseudo spore balls), whereas *Fulvisporium* has firmly united, permanent spore balls.

Figs. 2–7. *Fulvisporium restifaciens* (D. E. Shaw) K. Vánky on *Stipa stuposa* Hughes (HUV 17637).

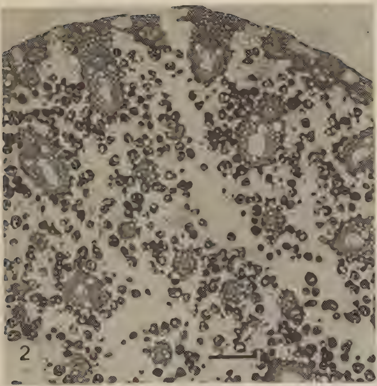
Fig. 2. TS of a young sorus, still protected by the epidermis and subepidermal host tissues. Between the intact vascular bundles the parenchyma tissue is more or less destroyed and replaced by spore balls. Bar = 100 µm

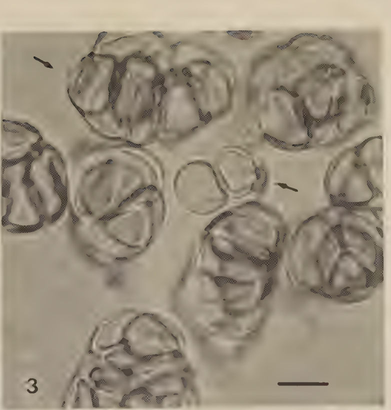
Figs. 3, 4. Spore balls in LM and in SEM. The germ pores, possessing thinner wall, are slightly protruding in the rehydrated spores (Fig. 3, arrows), but depressed in dried spores (Fig. 6, arrow). Bars = 10 µm

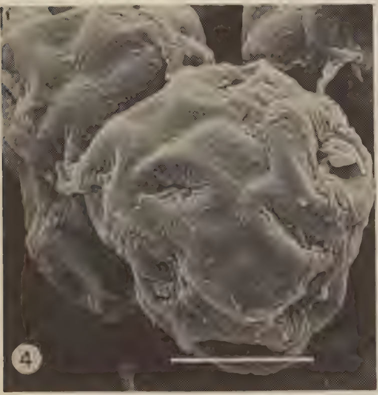
Fig. 5. Squashed young sorus with spore balls in various developmental stages (in lactophenol with cotton blue). Bar = 10 µm

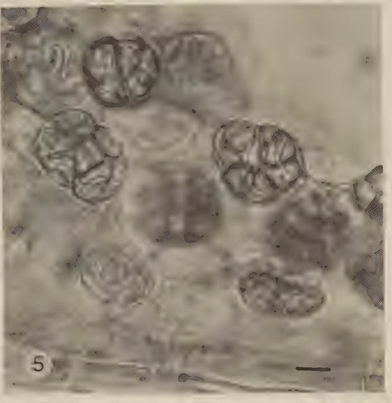
Fig. 6. TS of a spore ball between empty cells of the host plant, seen in TEM. The spores have a thin endospore and an irregularly thick, electron-dense exospore. Bar = 2 µm

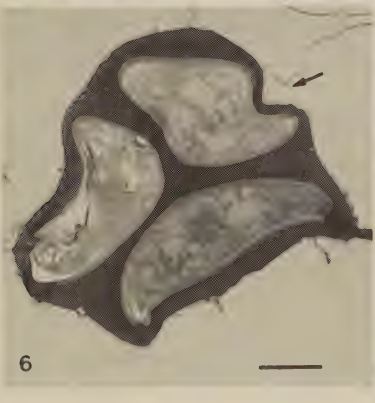
Fig. 7. Septal wall and porus in TEM. The wall (arrow) has a thin, electron-transparent middle lamella and two outer, electron-opaque layers. The porus (arrow head) is simple, the pore canal is small, occluded by electron-opaque material. Bar = 0.1 µm

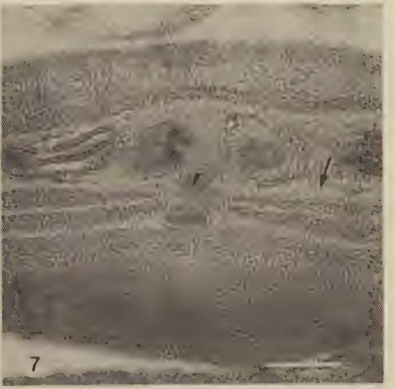

2

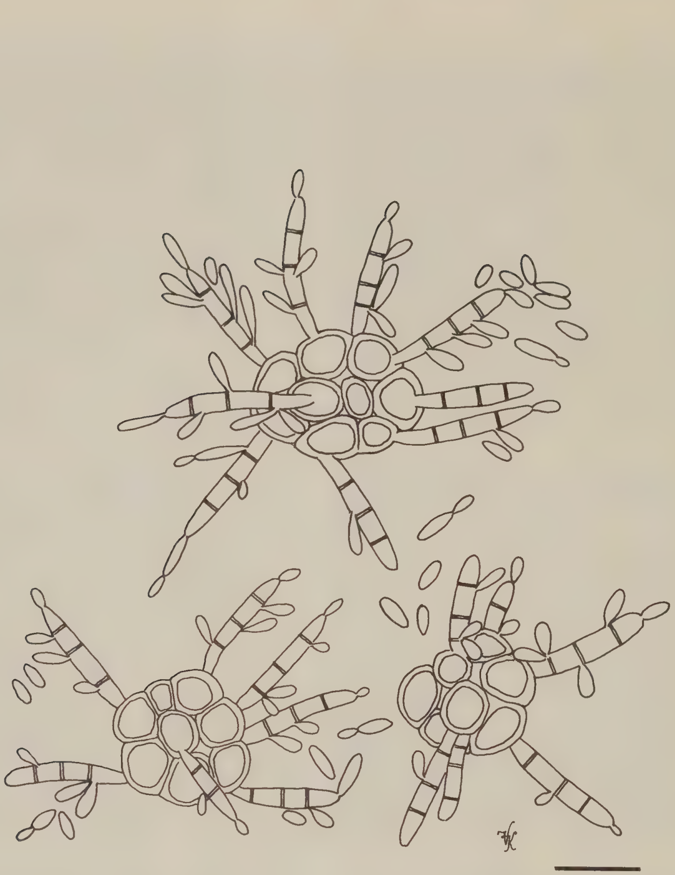

3


4


5


6


7



8

Fig. 8. Germinating spores of *Fulvisporium restifaciens* (D. E. Shaw) K. Vánky with septate, 4-celled basidia on which laterally and terminally ovoid basidiospores are produced (on MYP, at room temp., after 1–2 days; HUV 17637). Bar = 10 µm

Sequence data of 5 smut fungi were completed with the known sequences of *Microbotryum violaceum* (Pers. : Pers.) G. Deml & Oberw., *Tilletia caries* (DC.) L.-R. & C. Tul., and *Ustilago hordei* (Pers.) Lagerh. (Boekhout et al., 1995; Berres et al., 1995). An alignment of 551 bp was created using the multiple alignment from ClustralW.

Neighbour joining analysis of the alignment results in the topology shown in Fig. 9. Other analysis methods like maximum parsimony or maximum likelihood are leading largely to the same topology. Rooting the tree in the longest internal branch yields two different lineages of evolution. One including *Aurantiosporium subnitens*, *Fulvisporium restifacines* and *Microbotryum violaceum* represents a group of smut fungi having phragmobasidia and intercellular hyphae. The second lineage including *Thecaphora seminis-convolvuli*, *Tilletia caries*, *Tolyposporella brunkii*, *Tolyposporium junci* and *Ustilago hordei* has either taxa with phragmobasidium and intracellular hyphae or taxa with holobasidium and intercellular hyphae.

These data also support the separation of *Fulvisporium restifaciens* from the genus *Tolyposporium*. Molecular sequence data show on the one hand that there is no close relationship between *Fulvisporium restifacines* and the analysed members of the genera *Thecaphora*, *Tolyposporella* and *Tolyposporium* and no close relationship between these three last-mentioned genera. On the other hand the molecular sequence data reveal a close relationship between *Fulvisporium restifaciens* and *Aurantiosporium subnitens*, discussed above.

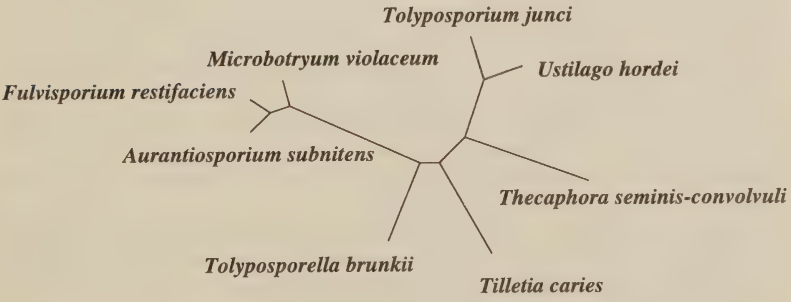

Tolyposporium junci
Microbotryum violaceum
Ustilago hordei
Fulvisporium restifaciens
Aurantiosporium subnitens
Thecaphora seminis-convolvuli
Tolyposporella brunkii
Tilletia caries

Fig. 9. Topology resulting from neighbour joining analysis of partial LSU rDNA gene sequences from 8 smut fungi. Branch lengths represent the distances of the sequences.

ACKNOWLEDGEMENTS

The authors are grateful to Professor H. Scholz (Berlin, Germany) for reading the manuscript and serving as pre-submission reviewer, and to Dr. S. Tóth (Gödöllő, Hungary) for providing the Latin description. The technical assistance of Mrs. J. Götze in DNA sequencing, of Mr. H. Schoppmann with SEM, and of Mr. F. Albrecht with photographic work is kindly acknowledged.

LITERATURE CITED

Atkinson, G. F. 1897. Some fungi from Alabama. – Cornell Univ. Sci. Bull. 3:1-50.

Berres, M. E., Szabo L. J. & McLaughlin, D. J. 1995. Phylogenetic relationships in auriculariaceous basidiomycetes based on 25S ribosomal DNA sequences. – Mycologia 87:821:840.

Boekhout, T., Fell, J. W. & O'Donnell, K. 1995. Molecular systematics of some yeast-like anamorphs belonging to the Ustilaginales and Tilletiales. – Stud. Mycol. 38:175-183.

Edwards, K., Johnstone, C. & Thompson, C. 1991. A simple and rapid method for the preparation of plant genomic DNA for PCR analysis. – Nucleic Acids Research 19(6):1349.

Felsenstein, J. 1993. PHYLIP (Phylogeny Inference Package). Version 3.5c. University of Washington, Seattle.

Henrion, B., Le Tacon, F. & Martin, F. 1992. Rapid identification of genetic variation of ectomycorrhizal fungi by amplification of ribosomal RNA genes. – New Phytol. 122:289-298.

Ingold, C. T. 1987. Aerial sporidia of *Ustilago hypodytes* and of *Sorosporium saponariae*. – Trans. Brit. Mycol. Soc. 89:471-475.

Nagler, A., 1986. Untersuchungen zur Gattungsabgrenzung von *Ginanniella* Ciferri und *Urocystis* Rabenhorst sowie zur Ontogenie von *Thecaphora seminis-convolvuli* (Desm.) Ito. – Dissertation. Fakultät für Biologie der Eberhard-Karls-Universität Tübingen, pp. 349.

Shaw, D. E. 1952. Ropy smut of Liverpool Plains Grass. – Proc. Linn. Soc. New South Wales 77:142-145 + Pl. VIII.

Thirumalachar, M. J., Whitehead, M. D. & O'Brien, M. I. 1967. Studies in the genus *Tolyposporella*. – Mycologia 59:389-396.

Thompson, J. D., Higgins, D. G. & Gibson, T. J. 1994. ClustralW: improving the sensitivity of progressive multiple sequence alignment through sequence weighting, position-specific gap penalties and weight matrix choice. – Nucleic Acids Research 22(22):4673-4680.

Vánky, K. 1987. Illustrated genera of smut fungi. – Cryptogamic Studies 1:1-159 (ed. W. Jülich). Gustav Fischer Verlag, Stuttgart/New York.

NOTE

The alignment of rDNA sequences is available from the third author upon request.

MYCOTAXON

Volume LXIV, pp. 67-81 September 1997

CHANGBAI WOOD-ROTTING FUNGI 6. STUDY ON ANTRODIELLA, TWO NEW SPECIES AND NOTES ON SOME OTHER SPECIES

YU-CHENG DAI & TUOMO NIEMELÄ

Botanical Museum, P.O. Box 47, FIN–00014 University of Helsinki, Finland

ABSTRACT

Two new saprotrophic polypores (Basidiomycetes), *Antrodiella albocinnamomea* Y.C. Dai & Niemelä and *A. ussurii* Y.C. Dai & Niemelä are described and illustrated. Both species were found in Changbai Mts., northeastern China and the Russian Far East. The former species is characterized by resupinate basidiocarps, white or cinnamon pores, clavate to pyriform cystidia and fairly big spores, and by its growth mostly on *Acer* and *Tilia*. The latter species has resinous basidiocarps which are mostly pileate, tan to pale brown; spores are small, oblong-ellipsoid. Unlike in most other species of the genus, the skeletal hyphae bear a distinct lumen. Two collections are identified as *Antrodiella cf. americana* Ryvarden & Gilb.; they are very similar to the type, but have some differences on skeletals and spores. *A. citrinella* Niemelä & Ryvarden was found in China; this is the first record outside Europe. *A. gypsea* (Yasuda) T. Hattori & Ryvarden is fairly common in Northeast Asia. Subulate cystidia and very narrow skeletal hyphae distinguish it from the other species of the genus. The Changbai material of *A. semisupina* (Berk. & M.A. Curtis) Ryvarden has broad ellipsoid spores. This fits with reports and collections from central Europe, while the spores are narrower, suballantoid in North European collections.

Key words: *Antrodiella*, *A. albocinnamomea*, *A. ussurii,* Changbai Mts., China, polypores, taxonomy

INTRODUCTION

A team of mycologists in Helsinki, Finland, is studying the diversity and ecology of wood-rotting fungi in the Temperate and Boreal North, especially in old forests of Eurasia. This is the sixth paper devoted to the polypores of the Changbai Mountain Range, northeastern China. Previously (Dai 1995; Dai & Niemelä 1994, 1995) two new species in *Anomoporia* Pouzar and *Phellinidium* (Kotl.) Fiasson & Niemelä were described, and some combinations were proposed. The Changbai Mts. area contains one of best remnants of the old-growth forests in China, and the Changbaishan Forest Reserve supports a unique diversity of animal, plant and fungus species anywhere in temperate forests. For a detailed background of the area see Yang et al. (1987).

Collections of polypores from Changbai Mts. revealed two undescribed species. They have more or less resinous basidiocarps, a dimitic hyphal structure, cyanophilous skeletals and small spores, and they cause a white rot. These characters fit *Antrodiella* Ryvarden & I. Johans. very well, and the species are described as *A. albocinnamomea* Y.C. Dai & Niemelä and *A. ussurii* Y.C. Dai & Niemelä.

A NOTE ON ANTRODIELLA

Antrodiella was described by Ryvarden and Johansen (1980) to comprise the so-called *Polyporus semisupinus* Berk. & M.A. Curtis complex. Niemelä and Ryvarden (1983) defined the genus more clearly. At present there are about 40 species in *Antrodiella,* either transferred from other genera or described as new species in the genus. It is sure that more species will be found in the future.

Antrodiella is undoubtedly related to *Junghuhnia* Corda emend. Ryvarden: both produce white-rot, have similar spores, and their hyphal structures are alike. The main separating character is the presence of skeletocystidia in *Junghuhnia*. Ryvarden & Gilbertson (1993) emphasized the last-mentioned character, too, but their statement “cystidia absent or present as apical parts of skeletal hyphae which may bend into the hymenium” is a little confusing. Recently Vampola and Pouzar (1996) made an emended description of the genus, and they indicated that cystidia are present or absent in the genus. In our opinion *Antrodiella* may have cystidia, e.g. *A. gypsea* (Yasuda) T. Hattori & Ryvarden, *A. parasitica* Vampola and the new species *A. albocinnamomea*. These cystidia originate from subhymenial generative hyphae, and do not arise from tramal skeletal hyphae. Therefore they should be called hymenial cystidia rather than skeletocystidia. Gloeocystidia may be present in some species, e.g. *A. americana* Ryvarden & Gilb., *A. faginea* Vampola & Pouzar and *A. thompsonii* Vampola & Pouzar; they arise from subhymenium as well.

Flaviporus Murrill is another genus related to *Antrodiella*, typified by *Polyporus brownei* Humb. which has typical skeletocystidia. In a monograph Ginns (1980) included in *Flaviporus* some light-coloured species which lack skeletocystidia. Later he (Ginns 1984) merged *Antrodiella* in *Flaviporus*. Such a wide definition makes the distinction between *Flaviporus* and *Junghuhnia* vague (Ryvarden & Gilbertson 1993). David and Rajchenberg (1992) also pointed out the heterogeneity of the genus *Flaviporus*. We here follow the concept of Ryvarden (1991), and keep *Antrodiella* independent.

A few *Antrodiella* species may have branched skeletal hyphae, and in such cases the hyphal structure is somehow similar to that of *Trametes* Fr. which, however, has big cylindric spores and in particular acyanophilous skeletal hyphae.

In the microscope *Antrodiella* is characterized by more or less gelatinized hyphae, dimitic (to trimitic) structure, small spores which are generally less than 5 μm long, and by the lack of skeletocystidia. However, hymenial cystidia are found in a few species. Generative hyphae bear clamps in most species, and skeletal hyphae are dominant and cyanophilous.

Antrodiella, *Flaviporus*, *Junghuhnia*, *Irpex* Fr., *Flavodon* Ryvarden and *Steccherinum* S.F. Gray appear related in the microscope, and they all are white-rot fungi. The placement of species in these genera is not satisfactory, however. The first three genera include the poroid species, the last one is predominantly hydnoid. The only species in *Irpex, I. lacteus* (Fr.:Fr.) Fr. is poroid when young and hydnoid when mature, and the same applies with *Flavodon* (the only species *F. flavus* (Klotzsch) Ryvarden), and some species of *Steccherinum*, e.g. *S. oreophilum* Lindsey & Gilb. The genera *Irpex* and *Flavodon* are characterized by simple-septate hyphae, but that character is also found in some species of *Steccherinum* (e.g. *S. subcrinale* (Peck) Ryvarden, *S. cremeoalbum* Hjortstam). In the classification of Aphyllophorales there are many examples of genera including both lamellate, poroid and/or hydnaceous species, and species with both clamped and simple-septate hyphae, and so these characters do not *per se* suffice divisions into separate genera. Other and more profound reasons should therefore be found in the generic classification of this complex.

One character which might be of importance is the hymenophoral configuration in the hydnaceous species. Some species in *Steccherinum* bear spines that are from the very beginning cylindric in their transverse section. Examples are *S. ochraceum* (Pers.:Fr.) S.F. Gray and *S. bourdotii* Saliba & A. David. Others have flat, tooth-like spines, which in fact arise from a more or less poroid primordial stage. *S. oreophilum* serves as an example of this type. The flat-toothed species may find a more natural place together with the subporoid ones. The whole complex could accordingly be divided into four groups (genera): *Antrodiella* (poroid, with or without hymenial cystidia), *Junghuhnia* (constantly poroid, with skeletocystidia), *Irpex* (initially poroid/subporoid, developing into irpicoid, with skeletocystidia), and *Steccherinum* (truly hydnoid or almost smooth, with skeletocystidia).

MATERIAL AND METHODS

The study is based on the collections from northeastern China (under investigation in Helsinki, H), and on specimens from H (Finland), HBNNU (Changchun, China), PRM (the Czech Republic) and TAA (Estonia). Some type specimens from BPI (USA), FH (USA), K (UK), NY (USA) and TFM (Japan) were studied to support our results.

The measurements and drawings were made from mounts stained with Cotton Blue (CB). Spores were measured from sections cut from the tubes. IKI stands for Melzer's reagent and KOH for 5% potassium hydroxide; CB+ means cyanophilous and CB– acyanophilous; IKI– means inamyloid and indextrinoid. In presenting the variation in the size of the spores (basidia, basidioles, cystidia, hyphae and pores), 5% of the measurements were excluded from each end of the range, and are given in parentheses. In the text the following abbreviations are used: L= mean spore length (arithmetical mean of all spores), W= mean spore width (arithmetical mean of all spores), Q= quotient of the mean spore length and the mean spore width (L/W ratio), (n=x/y) x measurements of spores (basidia, basidioles, cystidia, hyphae and pores) from y specimens. The width of a basidium (basidiole, cystidium) was measured at the thickest part, the length of a basidium (basidiole, cystidium) was measured from the apex (sterigmata excluded for basidium) to the basal septum. Sections were studied at magnification up to ×1250 by using a Leitz Diaplan microscope and phase contrast illumination. Drawings were made with the aid of a drawing tube. Colour terms follow Rayner (1970). Authors of the scientific names have been abbreviated according to Brummitt and Powell (1992), except for evident misspellings in that book.

DESCRIPTIONS

Antrodiella albocinnamomea Y.C. Dai & Niemelä, *spec. nova* (Fig. 1)
Carpophorum annuum, resupinatum, raro effuso-reflexum, primo niveum, fimbriatum, demum cinnamomeum. Pori angulati vel rotundi, 3–5 per mm. Systema hypharum dimiticum, hyphae generatoriae fibulatae, hyphae skeletales subiculi 3.5–6 μm in diam. Cystidia frequentia vel pauca, clavata vel pyriformia. Sporae oblonge-ellipsoideae, 3.7–5 × 2.1–2.9 μm.

Holotype: China. Jilin Prov., Antu County, Changbaishan Forest Res., alt. 1100 m, mixed old-growth forest, on stump of *Acer*, 5.IX.1993 *Dai 1063* (H, isotype in HMAS). — Representative paratype with white poroid surface: China. Liaoning Prov., Kuandian County, Guanshui, alt. 650 m, managed forest, on fallen trunk of *Acer*, 1995 *Dai 2184* (H, HMAS).

Etymology. — *albus* (Lat., adj.): white; *cinnamomeus* (Lat., adj.): cinnamon-coloured.

Basidiocarps annual, mostly resupinate, very rarely effused-reflexed, easily detachable, when juvenile snow-white, becoming cream to pale cinnamon with age, elastic tough to leathery, when mature orange to cinnamon and more or less cartilaginous. Often growing in extensive groups of fructifications. Margin thinning out, cottony to fimbriate when juvenile. Pores angular or round, 3–5(–6) per mm (n=195/8), tube mouths thin, even or a little lacerate. Section: subiculum cream, thin (not exceeding 0.5 mm), a very thin crust present in the bottom next to wood; tube layer cream to pale cinnamon, tubes corky to cartilaginous, up to 3 mm long. No distinct odour, taste mild.

Hyphal system dimitic, generative hyphae bearing clamp connections, skeletal hyphae dominant, IKI–, CB+, and unchanged in KOH.

Subiculum. — Generative hyphae thin-walled, frequently branched, (2.1–)2.5–4(–5) μm in diam (n=60/2); skeletal hyphae thick-walled to subsolid, dominant, sinuous, sometimes encrusted with small crystals, rarely branched, (2.4–)3.5–6(–6.5) μm in diam (n=90/3). Large, rhomboid or irregular crystals frequently present. The thin crust made up of subsolid, brownish and strongly agglutinated hyphae.

Tubes. — Tramal hyphae more or less gelatinized, freely oriented to subparallel. Generative hyphae thin-walled, frequently clamped and branched, (1.8–)2–2.6(–3) μm in diam (n=30/1); skeletal hyphae thick-walled, mostly bearing

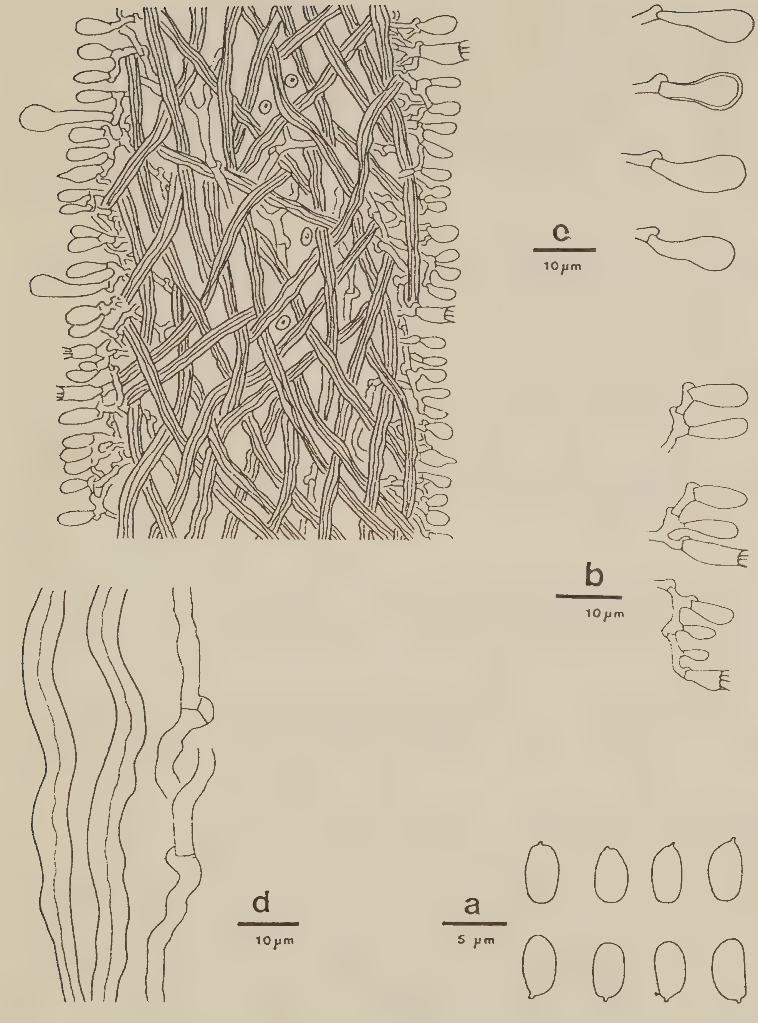


Fig. 1. Anatomical details of *Antrodiella albocinnamomea* Y.C. Dai & Niemelä (drawn from the type). —a: Basidiospores. —b: Basidia and basidioles. —c: Cystidia. — d: Generative hyphae and skeletal hyphae from subiculum. —e: A section through trama.

a narrow lumen, unbranched, winding in tube bottoms, fairly straight elsewhere in trama, thinner than those in subiculum, (2.4–)2.8–3.2(–3.4) μm in diam (n=30/1). Hymenial cystidia frequent to scanty, clavate to pyriform or bottle-shaped, mostly thin-walled, occasionally thick-walled, smooth, (13–)14–18(–21) × (4–)5–7.5(–9) μm (n=40/3); hyphal pegs infrequent; subhymenium indistinct. Basidia infrequent present, shortly clavate to barrel-shaped, bearing four sterigmata and a basal clamp, (7–)8–10(–11) × (3.5–)3.6–4.5(–5) μm (n=34/2), basidioles dominant in hymenium, in shape similar to basidia, 6–8(–10) × 3–4 μm (n=30/1). Large and irregular crystals common.

Spores. — Basidiospores mostly oblong-ellipsoid, a few more or less subcylindrical, thin-walled, hyaline, smooth, IKI–, fairly CB+, (3–)3.7–5(–5.5) × (2–)2.1–2.9(–3.3) μm, L=4.18 μm, W=2.38 μm, Q=1.61–1.84 (n=183/6).

Additional specimens examined. — China. Jilin Prov., Antu County, Changbaishan Forest Res., on fallen trunk of *Tilia*, 1993 *Dai 997 & 1000;* on fallen trunk of *Acer, 1993 Dai 999, 1078 & 1085*. Huinan County, Hongqi, on rotten stump of *Tilia*, 1993 *Dai 1516*. Liaoning Prov, Kuandian County, Guanshui, on rotten wood of *Tilia*, 1995 *Dai 2166*; on rotten stump and fallen trunk of *Acer*, 1995 *Dai 2169, 2175 & 2187*; on stump of *Carpinus*, 1995 *Dai 2183*; on fallen trunk of *Juglans*, 1995 *Dai 2192*. Russia. Sakhalin Region, Nevel'sk, Kuznetsovo, on *Alnus*, 1979 *Parmasto* (TAA 120470).

The cinnamon colour of mature *Antrodiella albocinnamomea* superficially recalls some *Junghuhnia* species. As discussed above, we consider the skeletocystidia to be a fundamental character to distinguish *Antrodiella* and *Junghuhnia*. The present species only has smooth hymenial cystidia, and so we address it in *Antrodiella* in spite of its reminiscence of *Junghuhnia*.

Juvenile *Antrodiella albocinnamomea* resembles *A. incrustans* (Cooke) Ryvarden which, however, has ochraceous or wood-coloured pores. Pores of *A. incrustans* are a little smaller (4–6 per mm, n=38/4, vs. 3–5 per mm in *A. albocinnamomea*), and spores are ellipsoid, hyaline, thin-walled, IKI–, CB–, (3–)4–5(–6) × (2.1–)2.4–3.2(–3.5), L=4.37 μm, W=2.89 μm, Q=1.47–1.55 (n=120/4). It lacks cystidia, and hyphae dissolve in 5% KOH. The last two characters are quite different from those in *A. albocinnamomea*.

Antrodiella aurantilaeta (Corner) T. Hattori & Ryvarden is known from the East Asian islands of Taiwan and Japan. It has orange-coloured pores, and usually has an effused-reflexed habit. The pileus is distinctly duplex, bearing a thin black line between the two layers of the context, and its pores are large and irregular or daedaleoid (1–3 per mm). Microscopically it has smaller spores (3–4 × 1.5–2 μm) and there are no cystidia (Hattori & Ryvarden 1993). According to our study the tramal hyphae are not agglutinated, which is an exceptional character in the genus.

Another yellow-pored species, *Antrodiella citrinella* Niemelä & Ryvarden, has also been found in Changbai Mts. Unlike *A. albocinnamomea*, it makes very small fructifications and is associated with *Fomitopsis pinicola* (Sw.:Fr.) P. Karst. (Niemelä et al. 1995). It lacks cystidia and its spores are subglobose and smaller (3–3.4 × 2–2.5 μm, Niemelä & Ryvarden 1983) than in the new species.

The following species of *Antrodiella* have hymenial cystidia: *A. gypsea*, *A.*

parasitica and *A. subcrassa* (Rodway & Cleland) Buchanan & Ryvarden. They differ from *A. albocinnamomea* in the following way: *A. gypsea* usually has pileus and subulate cystidia, and its pores and spores are smaller (7–8 per mm and 2.3–3 × 1.2–1.7 μm respectively). *A. parasitica* grows especially on fruit bodies of *Trichaptum abietinum* (Pers.:Fr.) Ryvarden or on adjacent wood (*A. albocinnamomea* has no distinct association with other fungi), it has white pore surface and smaller ellipsoid spores (3–3.8 × 2–2.4 μm, Vampola 1991). *A. subcrassa* has a perennial habit, smaller pores and narrower spores (5–7 per mm and 3.5–4.5 × 1.5–2 μm respectively, Buchanan & Ryvarden 1993).

Antrodiella faginea and *A. thompsonii* were recently distinguished from the *Polyporus semisupinus* complex (Vampola & Pouzar 1996). These two species have more or less clavate to lageniform gloeocystidia, but they differ from *A. albocinnamomea* by having much smaller spores (3–3.7 × 1.9–2.2 μm in *A. faginea,* and 3–3.7 × 1.5–2 μm in *A. thompsonii*, Vampola & Pouzar 1996).

A pileate specimen from Sweden (Umeå, Herb. Pekka Bader, *Bader & Norstedt 108*) may represent *A. albocinnamomea.* It has oblong-ellipsoid spores, (3.7–)3.8–4.8(–5) × (1.9–)2–2.5(–2.6) μm, L=4.04 μm, W=2.13 μm, Q=1.90. It resembles *A. albocinnamomea* in having similar hyphal structure and cystidia, but differs by longer basidia (over 10 μm vs. 8–10 μm in *A. albocinnamomea*). Because the sole collection is small and was collected from *Picea*, its inclusion in *A. albocinnamomea* remains tentative.

Extensive frutifications, white- to cinnamon-coloured pores and a thin crust in the subiculum make *Antrodiella albocinnamomea* a remarkable fungus. Clavate to pyriform cystidia, and fairly big spores which are more or less cyanophilous, make it easily distinguishable from the other species in the genus. The number of cystidia varies in different collections: some specimens have only a few ones, some have abundant (e.g. *Dai 2084*). In all the specimens we have examined the hymenium is dominated by basidioles, while basidia are infrequent, and basidiospores are therefore scarce.

Antrodiella albocinnamomea seems to be not very rare in the Changbai Mts. area. Fourteen collections were obtained, six of them were collected from the Changbaishan Forest Reserve, and eight were found in mixed forests which are strongly influenced by man. The main hosts are *Acer* and *Tilia*, and no specimen was found on gymnosperms. Although many species in *Antrodiella* have associations with certain other wood-rotting fungi (Niemelä et al. 1995), no such associated fungi were found together with the present species. *A. albocinnamomea* mostly grows on rotten wood and fallen trunks, and it is evidently a saprotrophic species.

The comparison to related species was based on literature and examination of the following specimens: — *Antrodiella aurantilaeta*. Japan. Ibaraki, Ogawa, 1989 *Hattori* (TFM 15154). — *A. incrustans*. USA, New England, *Murray 5671* (K 35001, NY, holotype). North Carolina, Asheville, 13–24.VII.1908 *Murrill & House 427* (FH, BPI 239294 & 239295, K 35007, NY, type material of *Poria distorta* Murrill). — *A. parasitica*. The Czech Republic. Moravia, 1990 *Vampola* (H, MJ 1899). — *A. citrinella* and *A. gypsea* (see under these names in the following).

Antrodiella ussurii Y.C. Dai & Niemelä, *spec. nova* (Fig. 2)
Carpophorum annuum, pileatum vel effuso-reflexum, imbricatum. Pori angulati vel rotundi, 6–8 per mm. Systema hypharum dimiticum, hyphae generatoriae fibulatae, hyphae skeletales contexti 3.5–5 μm in diam. Sporae oblonge-ellipsoideae, 3–4 × 1.2–2 μm.

Holotype: China. Jilin Prov., Antu County, Changbaishan Forest Res., alt. 1100 m, mixed old-growth forest, on fallen trunk of *Populus*, 5.IX.1993 *Dai 1089* (H, isotype in HMAS).

Etymology. — *Ussuri*, a river between China and Russia in Northeast Asia.

Basidiocarps annual, often imbricate, pileate to effused-reflexed, rarely resupinate, readily detaching from substrate. When young watery and soft, elastic with age, and becoming very hard and cartilaginous to resinous upon drying. Upper surface pale tan to brownish, with concentric zones or sulcate, margin sharp. Poroid surface cream when young, yellowish cream to pale buff with age, becoming buff to pale brown upon drying, shining, pores angular or round, (5–)6–8(–9) per mm (n=140/7), tube mouths even or a little lacerate. Section: context tan, dense and hard, up to 3 mm thick; subiculum thin (not exceeding 1 mm) in resupinate basidiocarps; tube layer concolorous with pore surface, slightly more brownish than context, tubes brittle, up to 4 mm long. No distinct odour, taste mild.

Hyphal system dimitic (monomitic in juvenile stage), generative hyphae bearing clamp connections, skeletal hyphae dominant, all the hyphae IKI–, CB+, and unchanged in KOH.

Context. — Generative hyphae thin- to fairly thick-walled, frequently clamped and branched, 3–4.5(–5) μm in diam (n=60/2); skeletal hyphae thick-walled, mostly with a distinct lumen, a few subsolid, occasionally branched, sinuous, strongly interwoven, (3–)3.5–5(–5.5) μm in diam (n=61/2).

Tubes. — Tramal structure dimitic with a dense or gelatinous texture, hyphae freely oriented. Generative hyphae mostly thin-walled, sometimes fairly thick-walled, (2–)2.2–3.5(–4) μm in diam (n=30/1); skeletal hyphae thick-walled, bearing a distinct lumen, moderately branched, (2.5–)2.9–4 μm in diam (n=30/1); hyphal pegs infrequent. Secondary mycelium sometimes abundant in old tubes. Cystidia absent, cystidioles infrequently present, clavate, tapering at the end, 12–17 × 3–4 μm. Subhymenium indistinct. Basidia clavate, with four sterigmata and a basal clamp, (8–)9–11 × 4–4.8(–5) μm (n=30/1), basidioles in shape similar to basidia, 7–10 (–12) × 3–4.2(–4.5) μm (n=30/1).

Spores. — Basidiospores oblong-ellipsoid, thin-walled, hyaline, smooth, aguttulate or bearing one or two small guttules, IKI–, CB– or slightly CB+, (2.9–)3–4(–4.7) × (1.1–)1.2–2(–2.1) μm, L=3.50 μm, W=1.54 μm, Q=2.17–2.54 (n=260/8).

Additional specimens. — China. Jilin Prov., Antu County, Baoma, on rotten wood of *Populus*, 1993 *Dai 719 & 725*; Huangshongpu, on fallen trunk of *Acer*, 1993 *Dai 786 & 794*. Fushong County, Shuguang, on rotten wood of *Populus*, 1993 *Dai 604 & 614*. Huadian County, Dongxing, on fallen trunk of *Acer*, 1993 *Dai 1685 & 1720*. Huinan County, Hongqi, on fallen trunk of *Acer*, 1993 *Dai 1588b*. Wangqing County, Lanjia, on fallen trunk of *Tilia*, 1993 *Dai 1269*. Liaoning Prov.,

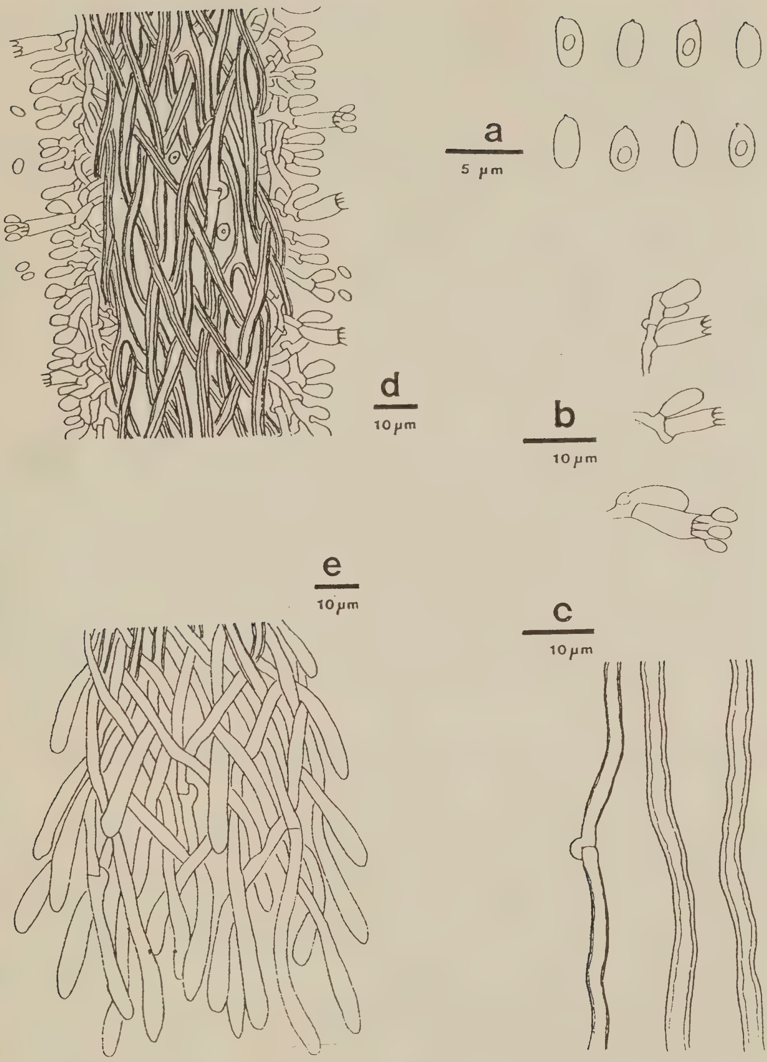

a
5 µm
b
10 µm
c
10 µm
d
10 µm
e
10 µm

Fig. 2. Anatomical details of *Antrodiella ussurii* Y.C. Dai & Niemelä (drawn from the type). —a: Basidiospores. —b: Basidia and basidioles. —c: Generative hyphae and skeletal hyphae from context. —d: A section through trama. —e: Hyphae at the dissepiment edge.

Kuandian County, Guanshui, on fallen trunk of angiosperm, 1995 *Dai 2002*. Shanxi Prov., Yao chan, 1935 *Licent 4799* (PRM 500627). Russia. Primorye Terr., Ternei Distr., on *Chosenia* (*Salix*), 1979 *Parmasto* (TAA 102877).

We call the hyphal structure of *Antrodiella ussurii* dimitic although it is slightly different from that in *A. semisupina* (Berk. & M.A. Curtis) Ryvarden. Some juvenile specimens have a monomitic structure: their thick-walled hyphae bear clamps as well. In mature basidiocarps the thick-walled hyphae have scanty clamps, but especially in subiculum and context the skeletals are distinct.

In general appearance *Antrodiella ussurii* is similar to juvenile *A. hoehnelii* (Bres.) Niemelä which, however, has somewhat larger pores (4–6 per mm). The spores of *A. hoehnelii* are curved and more or less tapering to the apiculus, its skeletal hyphae are thick-walled to subsolid and subparallel in trama, and it is usually associated with *Inonotus radiatus* (Sowerby:Fr.) P. Karst. A specimen from Shanxi Prov., China (see above) was identified as *A. hoehnelii* by Pilát (1940). We carefully examined the specimen, and it is in fact *A. ussurii*.

Antrodiella fissiliformis (Pilát) Gilb. & Ryvarden is closely related to *A. ussurii* by having similar spores and skeletals. According to Kotlaba and Pouzar (1988) it has orange to apricot pileus and white pores when fresh. In the microscope it has a monomitic hyphal structure intermixed with sparse thick-walled skeletal-like hyphae. They treated it as *Tyromyces fissiliformis* (Pilát) Kotl. & Pouzar. In North America *A. fissiliformis* was reported to be resupinate, and to have dextrinoid skeletals and thick-walled spores (Gilbertson & Ryvarden 1987). It was once addressed in *Perenniporia* Murrill (Gilbertson & Ryvarden 1985). We have studied a resupinate specimen from the Czech Republic. The tubes are very hard and brittle, and sharply different in colour and consistency from the context. This character was pointed out by Lowe (1966). The species has thin-walled spores and typically monomitic tramal structure, but a dimitic subiculum, and its skeletals are indextrinoid but more or less cyanophilous, thick-walled, bearing a distinct lumen. Vampola and Pouzar (1996) indicated that *A. fissiliformis* has cystidia.

Gilbertson and Ryvarden (1986) merged *Leptoporus duracinus* Pat. in *Polyporus versicutis* Berk. & M.A. Curtis, and referred the species to *Antrodiella*. We have examined the types of both taxa. There are some differences between them. *L. duracinus* has rather small pores (6–7 per mm), and its generative hyphae are abundant, thin- to thick-walled, frequently clamped. Skeletals are scanty in context, but dominant in trama; they are thick-walled, and bear a large lumen. On the contrary, *P. versicutis* has very small pores (10–11 per mm), the whole structure of fruit body has very scanty generative hyphae and dominant skeletals, and the skeletals are thick-walled to almost solid without a distinct lumen. In context the skeletals are frequently branched, and so the structure is trimitic. Although all the type materials in BPI, K and NY are sterile, in our opinion these two taxa should be kept independent. Lowe (1975) also treated them as two species in *Tyromyces* P. Karst. *L. duracinus* reminds *A. ussurii*, but it has cylindrical spores, 4–5(–5.2) × (1.4–)1.5–1.9(–2) μm (n=30/1), and its skeletals swell in KOH.

Antrodiella minutispora (D.A. Reid, Thind & Chatr.) Ryvarden was described from India. It has more or less tan-coloured basidiocarps and small pores (5–7 per mm, Reid et al. 1959), and it is somehow similar to *A. ussurii*. However, its pores darken upon drying, skeletals are almost solid and spores are shorter (2.5–3.5 × 1–1.5 μm, Reid et al. 1959; 2.5–3.5 × 1.5–2 μm, Ryvarden & Johansen 1980). *Flaviporus subhydrophilus* (Speg.) Rajchenberg & J.E. Wright was described from South America and it is a close relative of *A. minutispora*. Oblong-ellipsoid spores and clavate cystidioles make it resemble *A. ussurii*, but it differs by having flabelliform or reniform pileus, non-agglutinated tramal hyphae and acyanophilous skeletals (Rajchenberg & Wright 1987).

Antrodiella murrillii (Lloyd) Ryvarden resembles *A. ussurii*: pores, spores and hyphal structures are similar. However, it is stipitate, its context is distinctly duplex, and it was reported to be distributed only in Central America (Ryvarden 1990).

Antrodiella ussurii seems to be fairly common in northeastern Asia. We found lots of specimens of the species from the Russian Far East in the Tartu herbarium (TAA). In Changbai Mts. the species was found in several mixed managed forests. It grows on several genera of angiosperms, especially on rotten wood and fallen trunks, and it is obviously a saprophyte.

For comparison the following specimens were studied: — *Antrodiella fissiliformis*. The Czech Republic. Moravia, 1989 *Vampola* (H). — *A. hoehnelii*. Estonia. Pärnumaa, Koonga, 1996 *Dai 2234 & Niemelä* (H). Finland. Etelä-Häme, Lammi, 1985 *Niemelä 3278* (H). Germany. Hannover, 1977 *Jahn* (H). — *Leptoporus duracinus*. Guadeloupe. "Sur une branche d'un *Cecropia peltata* pourri, Bois du Grand-Etang, Patouillard 958" (FH, lectotype by Lowe 1975:53); "on *Cecropia peltata*, Guadeloupe, coll. Rev. Fr. A. Duss" (BPI 207785). Cuba, III.1905 *Ames* (BPI 225593). — *Polyporus versicutis*. Cuba. *Wright 215* (BPI 225598, type); *Wright 361* (BPI 225596, isotype); *Wright 208* (K 34997); no data (NY, isotype, Lowe 1971).

NOTES ON SOME OTHER SPECIES IN ANTRODIELLA

Antrodiella cf. americana Ryvarden & Gilb.

Two collections from China are identified as *A. cf. americana*. They have big pores (1–2 per mm), a very narrow lumen in tramal skeletals, oblong-ellipsoid spores (not tapering to apiculus), 3–4(–4.5) × (1.2–)1.3–2(–2.1) μm, L=3.60 μm, W=1.74 μm, Q=1.96–2.18 (n=62/2), lots of gloeocystidia in hymenium, and they are associated with dead fruit bodies of *Hymenochaete* Lév. In the type of *A. americana* spores are slightly tapering to apiculus, 3–3.8(–4) × 1.7–2(–2.2) μm, L=3.35 μm, W=1.90 μm, Q=1.77 (n=30/1), and tramal skeletals bear a large lumen. Otherwise all the other characters in the Chinese material are very similar to those of the type.

Material from Europe has distinctly smaller pores (3–6 per mm) and more brittle tubes, if compared with the bigger pores (1.5–2 per mm) and corky tubes in the type. Vampola and Pouzar (1996) implied that collections from Europe could represent another species. In the microscope we have not found significant differences between European material and the type (it is a very small piece), and for the time being we treat the European material as *A. americana*. There are examples when pore size varies distinctly between the European and American populations of a single species, e.g. in *Trichaptum abietinum*, *Gloeophyllum protractum* (Fr.) Imazeki, *Cerrena unicolor* (Bull.:Fr.) Murrill, etc.

Specimens examined. — China. Jilin Prov., Antu County, Changbaishan Forest Res., 1993 *Dai 1006;* Jilin Prov., without further data (HBNNU). Finland. Varsinais-Suomi, Bromarv, 1976 *Niemelä* (H). Uusimaa, Helsinki, 1984 *Saarenoksa 23584* (H); Sipoo, 1984 *Saarenoksa 20384* (H). USA. Pennsylvania, Cook Forest, 23.VI.1932 *Overholts & White* (BPI 237862, type).

Antrodiella citrinella Niemelä & Ryvarden

New to China. This species was described from Europe by Niemelä and Ryvarden (1983). The collection from Changbai Mts. is the first record out of Europe. The Chinese material has a little smaller pores (4–5 per mm vs. 3–4 per mm in Europe), and slightly larger spores (3–3.9 × 2.1–2.9 μm, n=30/1, vs. 3–3.4 × 2–2.5 μm in Europe, Niemelä & Ryvarden 1983). All the other macro- and microcharacters fit with the European material very well. It was found only once in the virgin forest of Changbaishan Forest Reserve. *Antrodiella citrinella* is usually associated with *Fomitopsis pinicola*. This phenomenon was noted by Niemelä and Ryvarden (1983) and Niemelä et al. (1992). Recently Niemelä et al. (1995) treated *A. citrinella* as one of the so-called successor species in interactions between fungi at late stages of wood decomposition. The Chinese collection was found on a dead basidiocarp of *F. pinicola*, too, and hence the relationship seems to be valid not only in Europe, but throughout the range of *A. citrinella*.

Specimens examined. — China. Jilin Prov., Antu County, Changbaishan Forest Res., 1995 *Dai 2013*. Further material. Finland. Etelä-Häme, Lammi, 1989 *Laurila & Renvall 1982* (H). Pohjois-Karjala, Lieksa, 1989 *Penttilä 1223* (H). Norway, Akershus, Oslo, 7.X.1982 *Ryvarden 20563* (H, isotype).

Antrodiella gypsea (Yasuda) T. Hattori & Ryvarden

This polypore remained poorly known, almost forgotten, after its original and simple description in Japanese (Yasuda 1918). Hattori and Ryvarden (1994) transferred it in *Antrodiella* and prepared an illustrated description. It was reported as an annual species occurring in Japan. However, two Chinese collections are obviously perennial. Basidiocarps of the species are very variable: sometimes they are typically pileate, sometimes effused-reflexed so that resupinate parts are dominant but bear numerous small pilei. The species may occupy half of a big log and make abundant and extensive fructifications. According to our measurements the pores in the isotype are a little smaller (6–8 per mm, n=30/1) than they were reported to be (5–6 per mm, Hattori & Ryvarden 1994). In the microscope *A. gypsea* differs from the other species in the genus by its narrow skeletal hyphae (not exceeding 2.5 μm in diam, vs. over 2.5 μm in diam in most other species of the genus). The thin-walled and subulate cystidia made up another diagnostic character. Basidiospores are scanty in most of the Chinese collections and the isotype, they are hyaline, and can sometimes be found only in phase-contrast illumination. The spores are oblong-ellipsoid, (2.5–)2.6–3(–3.1) × 1.2–1.7(–1.8) μm, L=2.90 μm, W=1.37 μm, Q=2.11 (n=30/1, specimen *Dai 1033*).

Junghuhnia conchiformis X.L. Zeng & Ryvarden was described from Changbai Mts. It also inhabits *Abies*, but has a little bigger spores (2.5–3.5 × 2–2.5 μm, Zeng & Ryvarden 1992). According to the description this taxon would seem to be *Antrodiella gypsea*.

Antrodiella gypsea is common in Changbai Mts. It is apparently widely distributed in northeastern Asia, because we saw lots of specimens of the species from the Russian Far East in TAA. It mostly grows on *Abies*, commonly on rotten wood, fallen trunks, occasionally on stumps, charred wood or living trees. It is saprotrophic and probably necrotrophic.

Specimens examined. — China. Jilin Prov., Antu County, Changbaishan Forest Res., 1993 *Dai 833* (O), *835, 1017, 1033 & 1048*; 1995 *Dai 2034 & 2126*. Huadian County, Dongxing, 1993 *Dai 1662*. Huinan County, Hongqi, 1993 *Dai 413 & 1530*. Wangqing County, Lianjia, 1993 *Dai 1251*. Japan. Tofuku, Sendai, 26.V.1912 *Yasuda* (TFM 16663, isotype). Russia. Primorye Terr., Ternei Distr., *Parmasto* (TAA 108874, 150896, 150910 & 151239).

Antrodiella semisupina (Berk. & M.A. Curtis) Ryvarden

Five collections from Changbai Mts. are identified as *Antrodiella semisupina*, although the spores are broad ellipsoid, (2.5–)3–3.9(–4) × (1.7–)2–2.4(–2.5) μm, L=3.23 μm, W=2.11 μm, Q=1.45–1.69 (n=164/5). One specimen (*Dai 1517*), however, has oblong-ellipsoid spores (3.2–4.2 × 1.4–2.0 μm, L=3.66 μm, W=1.75 μm, Q=2.09); it is included here as well. Ryvarden and Gilbertson (1993) write that immature spores of *A. semisupina* are more rounded than mature ones. The collection *Dai 1074* seems to be mature, but anyhow its spores are also broad ellipsoid. Niemelä et al. (1992) indicated that the species has narrow ellipsoid to allantoid spores in Finland. The collection *Dai 1517* agrees with Finnish material (see in the list) very well. Breitenbach and Kränzlin (1986) pointed out that *A. semisupina* has broad ellipsoid spores in the Swiss material. Moreover, we have checked one specimen from the Czech Republic, it has broad ellipsoid spores, too. Although Vampola and Pouzar (1996) recently described four new species from the *P. semisupinus* complex, there is probably still one further taxon involved. To solve this problem, more material should be studied and probably compatibility studies are needed. For the time being we keep this name for the Chinese collections, even though we are aware of the differences.

Specimens examined. — China. Jilin Prov., Antu County, Changbaishan Forest Res., 1993 *Dai 985, 1074 & 1077;* 1995 *Dai 2100*. Fushong County, Shuguang, 1993 *Dai 632*. Huinan County, Hongqi, 1993 *Dai 1517*. Further material examined. The Czech Republic. Moravia, 1990 *Vampola* (H). Finland. Varsinais-Suomi, Turku, 1993 *Niemelä 5726* (H). Uusimaa, Vantaa, 1985 *Niemelä 3220 & Saarenoksa* (H). Etelä-Häme, Koski, 1982 *Niemelä 2758* (H); Lammi, 1992 *Dai 87 & Niemelä* (H). Kittilän Lappi, Kittilä, 1970 *Niemelä* (H).

Acknowledgements. We thank Prof. Erast Parmasto (TAA, Estonia), Dr. Tsutomu Hattori (TFM, Japan), Dr. Xian-Yu Zeng (HBNNU, China) and curators of the herbaria of BPI (USA), FH (USA), K (UK), NY (USA) and PRM (the Czech Republic) for loans. Prof. Teuvo Ahti (Helsinki) generously helped with preparing the Latin descriptions; he and Prof. Nils Hallenberg (Göteborg) reviewed the manuscript. Financial support to Yu-Cheng Dai from the Academy of Finland (Project No. 2435, 1995–1996) is gratefully acknowledged.

LITERATURE CITED

Breitenbach, J. & Kränlin, F. 1988: Fungi of Switzerland 2. Non-gilled fungi, Heterobasidiomycetes, Aphyllophorales, Gasteromycetes. — Mykologia, Luzern. 412 pp.

Brummitt, P.K. & Powell, C.E. 1992: Authors of plant names. — Royal Botanic Gardens, Kew. 732 pp.

Buchanan, P.K. & Ryvarden, L. 1993: Type studies in the Polyporaceae 24. Species described by Cleland, Rodway and Cheel. — Australian Syst. Bot. 6:215–235.

Dai, Y.C. 1995: Changbai wood-rotting fungi 3. The genus Phellinidium (Basidio mycetes) and a new species, P. aciferum. — Ann. Bot. Fennici 32:63–73.

Dai, Y.C. 1996: Changbai wood-rotting fungi 5. Study on Polyporus mongolicus and P. tubaeformis. — Ann. Bot. Fennici 33:153–163.

Dai, Y.C. & Niemelä, T. 1994: Changbai wood-rotting fungi 1. A new species of Anomoporia (Basidiomycetes). — Ann. Bot. Fennici 31:65–69.

Dai, Y.C. & Niemelä, T. 1995: Changbai wood-rotting fungi 4. Some species described by A.S. Bondartsev and L.V. Lyubarsky from the Russian Far East. — Ann. Bot. Fennici 32:211–226.

David, A. & Rajchenberg, M. 1992: West African polypores: new species and combinations. — Mycotaxon 45:131–148.

Gilbertson, R.L. & Ryvarden, L. 1985: Some new combinations in the Polyporaceae. — Mycotaxon 22:363–365.

Gilbertson, R.L. & Ryvarden, L. 1986: North American polypores 1. Abotiporus – Lindtneria. — Fungiflora, Oslo. 433 pp.

Gilbertson, R.L. & Ryvarden, L. 1987: North American polypores 2. Megasporo poria – Wrightoporia. — Fungiflora, Oslo. 434–885 pp.

Ginns, J. 1980: The genus Flaviporus Murrill (Polyporaceae). — Canadian J. Bot. 58:1578–1590.

Ginns, J. 1984: New names, new combinations and new synonymy in the Corticiaceae, Hymenochaetaceae and Polyporaceae. — Mycotaxon 21:325–333.

Hattori, T. & Ryvarden, L. 1993: Antrodiella aurantilaeta (Polyporaceae, Basi diomycotina), a new polypore to Japan. — Trans. Mycol. Soc. Japan 34:363–368.

Hattori, T. & Ryvarden, L. 1994: Type studies in the Polyporaceae 25. Species described from Japan by R. Imazeki and A. Yasuda. — Mycotaxon 50:27–46.

Kotlaba, F. & Pouzar, Z. 1988: Type studies of polypores described by A. Pilát 1.

— Česká Mykol. 42:129–135.

Lowe, J.L. 1966: Polyporaceae of North America. The genus Poria. — State Univ. Coll. For. Syracuse Univ. Techn. Publ. 90:1–183.

Lowe, J.L. 1975: Polyporaceae of North America. The genus Tyromyces. — Mycotaxon 2:1–82.

Niemelä, T., Kotiranta, H. & Penttilä, R. 1992: New records of rare and threatened polypores in Finland. — Karstenia 32:81–94.

Niemelä, T., Renvall, P. & Penttilä, R. 1995: Interactions of fungi at late stages of wood decomposition. — Ann. Bot. Fennici 32:141–152.

Niemelä, T. & Ryvarden, L. 1983: Antrodiella citrinella: a new polypore species. — Karstenia 23:26–30.

Pilát, A. 1940: Basidiomycetes chinenses. — Ann. Mycol. 38:61–82.

Rajchenberg, M. & Wright, J.E. 1987: Type studies of Corticiaceae and Poly poraceae (Aphyllophorales) described by C. Spegazzini. — Mycologia 79:246–464.

Rayner, R.W. 1970: A mycological colour chart. — Commonwealth Mycol. Inst., Kew. 34 pp., 9 plates.

Reid, D.A., Thind, K.S. & Chatrath, M.S. 1959: The Polyporaceae of the Mussoorie hills (India) 4. — Trans. British Mycol. Soc. 42:40–44.

Ryvarden, L. 1990: Type studies in the Polyporaceae 22. Species described by C.G. Lloyd in Polyporus. — Mycotaxon 38:83–102.

Ryvarden, L. 1991: Genera of polypores. Nomenclature and taxonomy. — Synopsis Fungorum 5:1–363.

Ryvarden, L. & Gilbertson, R.L. 1993: European polypores 1. Abortiporus – Lindtneria. — Synopsis Fungorum 6:1–387.

Ryvarden, L. & Johansen, I. 1980: A preliminary polypore flora of East Africa. — Fungiflora, Oslo. 636 pp.

Vampola, P. 1991: Antrodiella parasitica, a new species of polypores. — Česká Mykol. 45:10–14.

Vampola, P. & Pouzar, Z. 1996: Contribution to the knowledge of the central European species of the genus Antrodiella. — Česká Mykol. 49:21–33.

Yang, H.X., Wang, Z., Jeffers, J.N.R. & Ward, P.A. (eds.) 1987: The temperate forest ecosystem (ITE Symposium 20). — Inst. Terrestrial Ecology & The Lavenham Press, Lavenham, Suffolk. 189 pp.

Yasuda, A. 1918: Notes on fungi (in Japanese). — Bot. Mag. Tokyo 32:249–250.

Zeng, X.L. & Ryvarden, L. 1992: Junghuhnia conchiformis nov. sp. (Polyporaceae, Basidiomycetes). — Mycotaxon 44:55–58.

MYCOTAXON

Volume LXIV, pp. 83-89 September 1997

ASTEROMIDIUM TABEBUIAE-IMPETIGINOSAE SP. NOV. CAUSING A LEAF SPOT DISEASE OF *TABEBUIA IMPETIGINOSA* IN BRAZIL

A.W.V. Pomella, R.W. Barreto, A.C.Alfenas and J.B. Mesquita

Departamento de Fitopatologia
Universidade Federal de Viçosa
36571-000, Viçosa, MG, Brazil

ABSTRACT

A new species of *Asteromidium* was found associated with a leaf spot disease of *Tabebuia impetiginosa* in Brazil. The pathogen, described here as *A. tabebuiae-impetiginosae* sp. nov., is characterized by having subepidermal, hypophyllous acervuli, and hyaline to olivaceous conidia, 44-57 x 2-3 µm.

Tabebuia impetiginosa (Mart. ex DC.) Standley. is a native Brazilian tree widely planted as an ornamental for its showy violet flowers. Furthermore, its timber is also regarded to be of excellent quality for house building and furniture manufacturing (Lorenzi, 1992).

Recently, a leaf spot disease leading to premature defoliation of *T. impetiginosa* was observed in Lavras, Minas Gerais, Brazil. The disease, which is associated with an acervular, mitosporic fungus, is commonly found during the rainy season (October to April). Using the keys provided by Sutton (1980), this fungus is best accommodated in the genus *Asteromidium* Speg.

In a comparison with other species of *Asteromidium* (Sutton, 1980; Ferreira and Muchovej, 1987), the present collection can easily be distinguished by its hypophyllous acervuli and conidium morphology. Based on these differences, the present collection is described as a new species below.

Asteromidium tabebuiae-impetiginosae A.W.V. Pomella & J.B. Mesquita, sp. nov. (Fig. 1-2).

Conidioma acervulatum (62.5-112.5 μm), subepidermale. Conidiophorum absens. Cellulae conidiogenae hyalinae vel olivaceae, lageniformes, laeves, holoblasticae sympodiales (9-12.5 μm). Conidium hyalinum vel olivaceum, falcatum vel sigmoideum, laeve, septatum (1)-2-(4), 44-57 x 2-3 μm.

HOLOTYPUS. BRAZIL: Minas Gerais, Lavras, in foliis vivis *Tabebuia impetiginosa*, J.B. Mesquita, 10 Apr. 1995, Herbário do Departamento de Micologia da UFPE, URM 75806 and part of type in herb. K.

Lesions circular, 1-5 mm diam., purple, separate, with a brownish center on the abaxial surface (Fig. 1C), and black on the adaxial surface, grouped within larger purple blotches. Internal mycelium, consisting of branched, septate, olivaceous hyphae. Conidiomata acervular, 62.5-125 μm diam., hypophyllous, subepidermal to erumpent (Fig. 1A-E), mostly solitary. Walls thin (3-4 μm), brownish. Conidiophores absent. Conidiogenous cell hyaline to olivaceous, holoblastic, sympodial, smooth, lageniform, 9-12.5 x 2.5-4 μm (Fig. 1B-2). Conidiogenous loci indistinct. Conidia hyaline to olivaceus, falcate or sigmoid, smooth, base truncate, apex obtuse, narrowed near the apex, scars unthickened, (1-)2(-4)-euseptate, 44-57 x 2-3 μm (Fig. 1D-2).

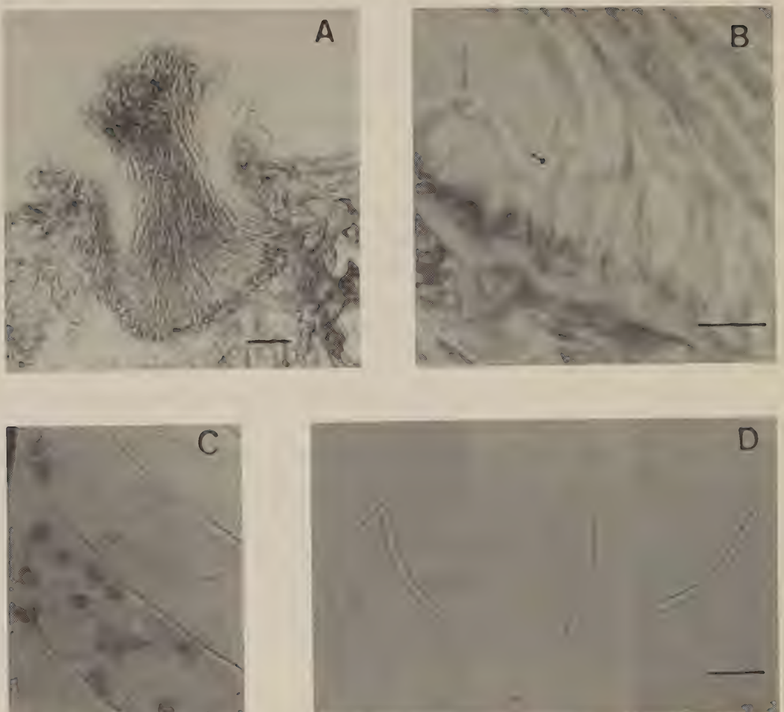
In culture: Slow growing on PDA (Johnston and Booth, 1983), V8 modified and Kado 523 agar (Kado and Heskett, 1970), 5 mm diam, on PDA, after 17 days at 25°C with a 12 h dark/near-ultraviolet light regime. Colonies felty, pseudostromatic and uniformly white (surface); sporulation poor under the conditions described above; chlamydospores produced abundantly intercalarly or terminally (Fig. 1F).

The genus *Asteromidium* was established for accomodating the species *Asteromidium imperspicuum* Speg. by Spegazzini (1888). This is an acervular fungus, associated with the leaves of an unidentified member of the *Sapindaceae*. Batista *et al.* (1959) described a second species from leaves of an unknown host in Venezuela as *Asteromidium secundum* Bat. & Peres. This fungus is however not regarded as congeneric with the type specimen, as it has pycnidia and distinct conidiophores. Sutton (1980) after re-examining the isotype of *A. imperspicuum*, retained *Asteromidium* as a distinct genus characterised by acervuli, and conidiophores reduced to conidiogenous cells. Tabosa and Albuquerque (1977) recorded a fungal pathogen belonging to the genus *Asteromidium* causing leaf spot in *Tabebuia serratifolia* (Vahl.) Nich. in Belem-PA. The same fungus was later recorded from Linhares-ES on another species of *Tabebuia*, and described as *Asteromidium tabebuiae* F.A. Ferreira & J.J. Muchovej (Ferreira and Muchovej, 1987).

Of the three *Asteromidium* species known, *A. tabebuiae-impetiginosae* is distinct in having conidia with fewer septa than those of *A. tabebuiae*, and differs from *A. imperspicuum* in conidial shape and size. Furthermore, *A. tabebuiae-impetiginosae* is presently the only species of *Asteromidium* known to have only subepidermal and deeper acervuli (Table 1).

The conidiogenous cells of *A. tabebuiae-impetiginosae* are similar to those found in *Septoria*, however this genus usually produce a pycnidial conidiomata whereas *A. tabebuiae-impetiginosae* have acervuloid conidiomata. Although for fungi originally included in *Asteromidium* have hyaline conidia and generally subcuticular conidiomata, we regarded this fungus as best placed in this genus owing for the other relevant characters already discussed.

Fig. 1A-F. *Asteromidium tabebuiae-impetiginosae*. A. Vertical section through an acervulus showing a cirrus. B. Conidiogenous cell (arrowed). C. Leaf spots on the abaxial leaf surface. D. Conidia. E. Vertical section through an acervulus (subepidermal position arrowed). F. Terminal chlamydospore (bars = 20 μm in A, D, E, and 10 μm in B & F).


A
B
C
D
E
F

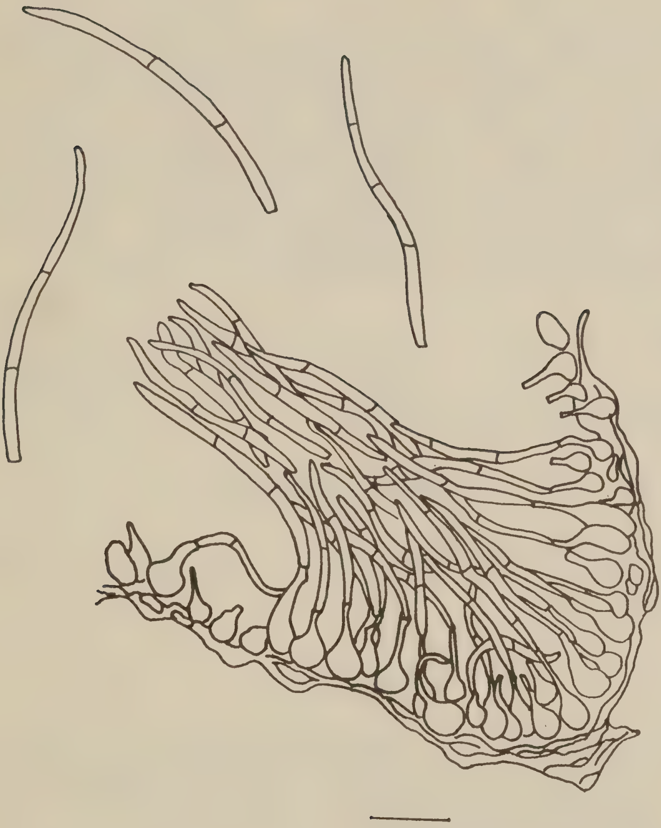


Fig. 2. Conidia and acervulus of *A. tabebuiae-impetiginosae*. Note the lageniform conidiogenous cells (Bar = 12,5μm).

TABLE 1 - Morphological characters ascribed to species of *Asteromidium*

	*A. secundum** (Batista and Peres, 1959)	*A. tabebuiae* (Ferreira and Muchovej, 1987)	*A.imperspicuum* (Sutton, 1980)	*A. tabebuiae-impetiginosae* sp. nov.
Conidia:				
Color	hyaline	hyaline	hyaline	hyaline to olivaceous
Shape	Cylindrical to fusoid	curved to straight	cylindrical to fusiform	falcate to sigmoid
Septation	3-5	3-8	3	(1-)2(-4)
Size (µm)	20-45 x 3-4	36.5-90 x 3.6-5.6	21-25 x 3	44-57 x 2-3
Conidiophores	present	absent	absent	absent
Conidiomata	pycnidial	acervular	acervular	acervular
Size	-	160 µm	50-70 µm	62.5-125 µm
Position	superficial	subcuticular to subepidermal	subcuticular	subepidermal
Conidiogenous cells				
Shape	-	-	± cylindrical	lageniform
Size (µm)	-	-	8-16 x 2.5-4.5	9-12.5 x 2.5-4
Host:	unknown	*Tabebuia serratifolia*	On *Sapindaceae*	*Tabebuia impetiginosa*

* Not considered as congeneric with *A. imperspicuum*.

ACKOWLEDGEMENTS

The authors wish to thank prof. F.A. Ferreira and Dr. P. Crous for their suggestions.

REFERENCES

BATISTA, A.C., PERES, G.E.P. and MAIA, H.S. 1959. Novas espécies de *Gelatosphaera*, *Asteromidium* e *Septoria* e antigas espécies de Sphaeropsidaceae. Instituto de Micologia, Universidade de Recife, Pernambuco, Publicação 214.

FERREIRA, F.A. and MUCHOVEJ, J.J. 1987. *Asteromidium tabebuiae* sp. nov. from Brazil. Mycotaxon 30: 97-100.

JOHNSTON, A., BOOTH, C., 1983. Plant Pathologist`s Pocketbook. CMI, Kew, UK. 439p.

LORENZI, H. 1992. Árvores brasileiras: manual de identificação e cultivo de plantas arbóreas nativas do Brasil. Editora Plantarum, Nova Odessa. pp. 51-52.

KADO, C.I. and HESKETT, M.G. 1970. Seletive media for isolation of *Agrobacterium, Corinebacterium, Erwinia, Pseudomonas* and *Xanthomonas*. Phytopathology 60: 969-976.

SPEGAZZINI, C., 1888. Fungi Guaranitici. Pugillus II. Anales de la Sociedad Científica Argentina 26: 1-76.

SUTTON, B.C., 1980. The Coelomycetes. CMI, Kew, UK. pp. 240-241.

TABOSA, S.A.S. and ALBUQUERQUE, F.C. 1977. Mancha escura das folhas, nova enfermidade do Ipê (*Tecoma serratifolia*) no Est. Pará, Brasil. Fitopatologia Brasileira 2:104-105 (Abstract).

MYCOTAXON
Volume LXIV, pp. 91-99 September 1997

A TAXONOMIC SUMMARY OF *ACHLYOGETON*

WILL H. BLACKWELL AND MARTHA J. POWELL
Department of Biology, James Madison University
Harrisonburg, Virginia 22807

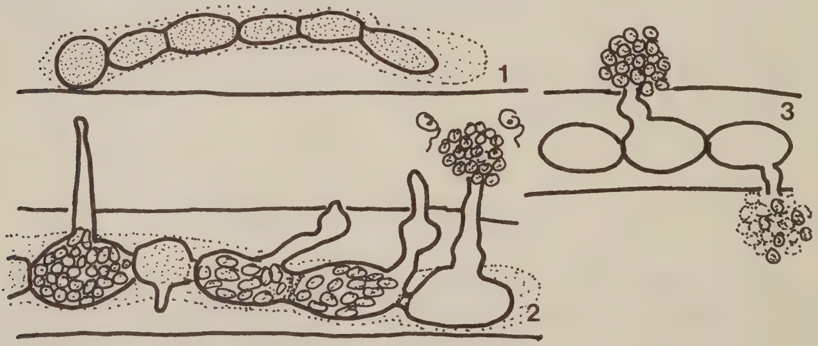
ABSTRACT

The genus *Achlyogeton* is of questionable taxonomic affinity, and has been considered to belong to either the Chytridiomycetes (where it has been suggested to anchor its own family, the Achlyogetonaceae) or else to the Oomycetes (considered perhaps to be a member of the Lagenidiaceae, in the latter case). The current state of confusion over correct taxonomic alignment of the genus, and its species, is summarized. We also indicate how eventual taxonomic solution might be accomplished. Several nomenclatural problems were identified, and are corrected or discussed.

TAXONOMIC RÉSUMÉ

Achlyogeton has been visualized as a small, chain-like, polycentric, holocarpic, intracellular, parasitic "chytrid" genus occurring in specific algae and nematodes. Schenk (1859a) described the genus *Achlyogeton* on the basis of a single species, *A. entophytum*, found as a parasite in an undetermined freshwater species of *Cladophora* (Figs. 1, 2). Schenk noted that the spores, rather than immediately swimming away, collected around the exit pore of the discharge tube in a manner similar to that of *Achlya*. He also observed a general morphological similarity of *Achlyogeton* to *Myzocytium* (now considered a lagenidiaceous genus). However, Schenk (1859a) illustrated zoospores which were posteriorly uniflagellate (Fig. 2), and interpreted *Achlyogeton* as what we would now call chytridiaceous.

Karling (1942) questioned the determination of the zoospores of *Achlyogeton entophytum* as uniflagellate, noting that Schenk apparently incorrectly considered some biflagellated types of zoospores, as for example those of *Myzocytium* (Schenk, 1858), *Lagenidium* (Schenk, 1859b), and even certain *Pythium* species (Schenk, 1859b), to be uniflagellate. However, Karling (1942), perhaps for lack of evidence, excluded the genus *Achlyogeton* from the biflagellate Lagenidiaceae (and thus from the Oomycetes). Yet, Karling (1948) doubted that zoospores of a true chytrid would go through a process of cluster and reemergence (Figs. 2,3) in the manner of certain Oomycetes (e.g., *Achlya*), and likewise did not affirm *Achlyogeton* as a chytrid. In this regard we may note that even if zoospores of *Achlyogeton* remain near the opening of the discharge tube, the same could be said to occur, temporarily, with zoospores of *Myzocytium*



FIGURES 1 - 3. *Achlyogeton entophytum* thalli. 1. Endobiotic thallus with catenulate, developing sporangia (based on Schenk 1859a). 2. Sporangia with discharged propagules, encysted and clustered at the orifice of the discharge tube (based on Schenk 1859a). 3. Sporangia with clustered cysts, some of which are empty, but no zoospores illustrated (based on Martin 1927).

(Lagenidiaceae), as their maturation is completed in a vesicle near the tube orifice (cf. Sparrow, 1960). Interpretations aside, questions such as these have kept the divisional placement of *Achlyogeton* in limbo.

Pursuant to Schenk, Cornu (1870) described *Achlyogeton solatium*, from his simultaneously described *Oedogonium obsidionale*, and assigned this *Achlyogeton* taxon to the family "Saprolégniée." Cornu noted a particular structure as "un oogone qui contient une ou plusieurs oospores," but further commented that this structure was "extrèmement irrégulier." If Cornu's assessment of this structure as an oogonium with potentially several oospores was correct, then *A. solatium* is unlikely to be a chytrid. Cornu, however, admitted to the incomplete study of this organism, observing for example no antheridia; it is thus difficult to determine, especially in the absence of an illustration, the precise relationship of this species. Karling (1977) incorrectly credited the description of *A. solatium* to Sorokine, rather than to Cornu.

The species actually described by Sorokine (1876), as noted by Karling (1942), was *Achlyogeton rostratum*, found in a nematode. Sorokine considered this organism to be a chytrid and questionably assigned the species, as "*Achlyogeton* ? *rostratum.*" Sorokine (1876) also reported *A. entophytum* from a nematode in western Russia; however, Sparrow (1960) questioned the true identity of Sorokine's "*entophytum.*" Sorokine considered that the discharge tube of *A. rostratum* was longer and more beaked, or enlarged toward the apex, than that of *A. entophytum.* Sorokine (1883) later summarized (with drawing) these alleged differences, apparently no longer doubting the generic assignment of *rostratrum.*

Martin (1927) found what he identified as *Achlyogeton entophytum* in *Cladophora* in West Okoboji Lake in Iowa in 1925. Martin indicated a strong resemblance to *Myzocytium proliferum*, but noted that the *Achlyogeton* species differed by developing no oogonia or antheridia, and by having a cluster of spores (Fig. 3) that did not immediately swim away (i.e., after release from the sporangial discharge tube, or any subsequent containing vesicle). Unfortunately, Martin made no notation or illustration of the number of flagella on a zoospore. Nonetheless, he considered both *Myzocytium* and *Achlyogeton* to be lagenidiaceous.

Dangeard (1932) described a new species of *Achlyogeton*, *A. salinum*, from a marine species of *Cladophora*. Dangeard was unable to say, however, exactly how this species was to be distinguished from *A. entophytum*. And, the illustration of the new species indeed appears similar to that of *A. entophytum* provided by Schenk (1859a), and as well the illustration of *A. entophytum* by Sorokine (1883). Dangeard also felt that *Achlyogeton* and *Myzocytium* were similar, the difference relating mainly to mode of spore discharge and dispersal. He also knew that flagellar number on the zoospore was important in determining proper taxonomic alignment, but apparently was unable to observe it. Nonetheless, Dangeard seemingly considered *Achlyogeton* to be a Chytridiomycete, referring to *A. salinum* as "une Chytridinée marine."

The taxonomic confusion surrounding *Achlyogeton* extends from division to family level, and to the acceptance of individual species. Sparrow (1942) assigned *Achlyogeton*, along with *Septolpidium* Sparrow and *Bicricium* Sorokine, to his newly erected chytrid family, Achlyogetonaceae. Karling (1948) subsequently added to this family the emended genus *Myiophagus* Sparrow; Sparrow (1939) had previously named the genus as "*Myrophagus* Thaxter." Karling (1948) proposed a substitute name (Septolpidiaceae) for the family; his rationale for this was his opinion that *Achlyogeton* might ultimately prove to be biflagellate, and hence not a chytrid genus at all. We surmise that Karling considered *Septolpidium* more definitively uniflagellate, and hence a better candidate upon which to establish a chytrid family. Sparrow (1960) felt that Karling lacked sufficient evidence to warrant a change of familial name. Sparrow continued to recognize *Achlyogeton* (and the Achlyogetonaceae) as a member of the Chytridiomycetes, based on his apparent determination of posteriorly uniflagellate zoospores with refractive globules. Karling (1977), however, still debated the number of flagella on the zoospores. Perplexingly, though suggesting to the contrary, Karling in this publication (1977) formally retained the chytrid family, Achlyogetonaceae, to include: *Achlyogeton*, *Septolpidium*, *Bicricium*, and *Myiophagus*.

At the species level, Karling (1942), in one way or another, questioned the taxonomic validity, and hence the recognition, of all of the species of *Achlyogeton*. Sparrow (1960), in fact, questioned all but *A. entophytum*. Of the alleged species of the genus, only *A. entophytum* and *A. rostratum* (corrected to "*rostratus*" below) seem to us specifically distinct, though we cannot disregard the other "species" since the hosts were different in each case. But, it remains to be confirmed, for example, that even *entophytum* and *rostratum* should be placed in the same genus, and that multiple genera are not in fact involved (described under the name of *Achlyogeton*).

If the genus *Achlyogeton* is recognized, to encompass one or more of the organisms historically named as *Achlyogeton*, it is still questionable whether or not the genus should be considered chytridiaceous or lagenidiaceous. The final resolution of these questions cannot be conclusively made from existing literature. Although we are inclined to believe Sparrow's (1960) determination of posteriorly uniflagellate zoospores, examination of the flagellation of these spores still seems warranted. Furthermore, the strong resemblance of Schenk's illustration (1859a) of *A. entophytum* and Sparrow's (1960, Fig. 79) illustration of *Myzocytium proliferum* seems too striking for mere superficial similarity. Additional evidence on the systematic status of *Achlyogeton* could be gained by examining electron microscopical sections of vegetative cells (we may as well say sporangia, since the organism is holocarpic), or zoospores, to determine whether the mitochondrial cristae are flattened or tubular--helping decipher the fungal (chytrid) versus stramenopile (oomycete) relationship of the genus. It is doubtful, however, that there have ever been any sustained, generationally perpetuated cultures of *Achlyogeton;* certainly, no such cultures are known to us. Hence, solution of the systematic questions posed here will reside primarily in future good fortune to collect material suitable for observation and study.

NOMENCLATURAL NOTATIONS

Regardless of the ultimate placement of *Achlyogeton* in the Chytridiomycetes, Oomycetes, or elsewhere, several nomenclatural notations are in order for names published (rightly or wrongly) under the genus. The first part of this generic name is obviously based on *Achlya* which is in turn based on the Greek noun *achlys* (mist or darkness), cf. Brown (1956). The vowel, -o- (rather than -a-), connecting to *-geton*, is considered correct for a name (such as *Achlya*) of Greek origin (Stearn, 1983). When transliterated from Greek to Latin, and based on the second part of the name, *-geton* (geiton, Greek, "neighbor"), i.e., the component used to determine gender (ICBN, 1994; Stearn, 1983), the genus name should be considered a masculine noun of the third declension (Brown, 1956; Stearn, 1983). It is irrelevant to the gender of *Achlyogeton* that the name *Achlya* is regarded as feminine (e.g., Wolf, 1944). Hence, the 1st/2nd declension epithet adjectives, *rostratum* (Sorokine) and *salinum* (Dangeard), also referred to as "group A" adjectives (Stearn, 1983), should be changed respectively to *rostratus* and *salinus*, i.e., they should bear masculine (rather than neuter) terminations, if placed under *Achlyogeton*. Regarding the form of the latter of these two epithets, we note that *salinum* is an accepted noun specifically meaning "salt-cellar" (Simpson, 1968). However, Dangeard's intent was to contrast his salt-water species with freshwater taxa. Hence, the adjective form *salinus* (of salt, saline, marine) should be employed (cf. Brown, 1956, Stearn, 1983).

If *phyton* (Greek) converts to *phytum* (Latin), see for example Stearn (1983), then the epithet *entophytum* (Schenk) should be viewed as properly spelled, and as a second declension neuter noun in apposition to the third declension masculine noun *Achlyogeton*. We disagree with Gledhill's (1989) contention, and the *de facto* implication of the ICBN (1994), cf. Article 23.5, that such substantives used as epithets are grammatically independent; appositional nouns should agree in case and number with the noun to which they are apposed (Freundlich, 1958; Hitchcock, 1925), although they may or may not be in the same declension or have the same gender. A similar situation exists with the true Latin epithet *solatium* (Cornu), also an appositional neuter noun in the second declension. More correctly, *solatium* should be spelled *solacium* (Simpson, 1968), Latin for a consolation or solace (viz., a comforter or companion of *Cladophora*). Although a change of spelling to *solacium* would avoid a potential confusion of meaning with terms intended to refer to the sun, e.g. *solatus* (Brown, 1956), the spelling *solatium* cannot be shown to be an actual error, and has been in fact the spelling occasionally employed for the Latin word meaning "consolation" (Dennison Latin Dictionary, 1964). Thus, in accordance with Article 60 of the ICBN (1994), the original spelling of the epithet, i.e. *solatium*, is retained.

Although we must for now beg the question of the actual relationship of *Achlyogeton* (and its species), and hence its true systematic placement (chytridiomycetes vs. lagenidiaceous oomycetes), we believe nonetheless that we have raised questions which will ultimately lead to solution of these questions. Regardless, we may note that correct citations for species described as belonging to *Achlyogeton* Schenk, when published under *Achlyogeton*, are (alphabetically): *Achlyogeton entophytum* Schenk, *A. rostratus* Sorokine, *A. salinus* Dangeard, and *A. solatium* Cornu.

ACKNOWLEDGEMENTS

We thank Dr. Michael A. Vincent, Curator of the Miami University (Ohio) Herbarium, and Mr. Michael A. Flannery, Director, and staff, of the Lloyd Library, Cincinnati, Ohio, for their assistance searching for literature. We also wish to thank Dr. Donald J.S. Barr (Agriculture and Agri-Food of Canada, Ottawa), Dr. Deborah M. Langsam (University of North Carolina at Charlotte), and Dr. David E. Padgett (University of North Carolina at Wilmington) for their thoughtful and helpful reviews of this manuscript.

LITERATURE CITED

BROWN, R.W. 1956. Composition of Scientific Words, rev. ed. Smithsonian Institution Press, Washington, D.C. 882 p.

CORNU, M.M. 1870. Note sur une saproléniée nouvelle, parasite d'une nouvelle espèce d'*Oedogonium*. Bull. Soc. Bot. France 17: 297-298.

DANGEARD, P.A. 1932. Observations sur la famille des Labyrinthulées et sur quelques autres parasites des *Cladophora* . Le Botaniste 24: 217-258.

DENNISON LATIN DICTIONARY. 1964. Latin-English and English-Latin Vest-Pocket Dictionary. Ottenheimer Publishers, Inc. 287 p.

FREUNDLICH, C.I. 1958. Review Text in Latin First Year. Amsco School Publications, New York. vi + 185 p.

GLEDHILL, D. 1989. The Names of Plants, 2nd ed. Cambridge University Press, Great Britain. vi + 202 p.

HITCHCOCK, A.S. 1925. Methods of Descriptive Systematic Botany. John Wiley & Sons, New York. vii + 216 p.

ICBN. 1994. International Code of Botanical Nomenclature (Tokyo Code). Koeltz Scientific Books, Königstein, Germany. (Reg. Veg., Vol. 131).

KARLING, J.S. 1942. The Simple Holocarpic Biflagellate Phycomycetes. Published by the Author, New York City. x + 123 p.

KARLING, J.S. 1948. Chytridiosis of scale insects. Amer. J. Bot. 35: 246-254.

KARLING, J.S. 1977. Chytridiomycetarum Iconographia. Lubrecht & Cramer, Monticello, NY. xiii + 414 p.

MARTIN, G.W. 1927. Two unusual water molds belonging to the family Lagenidiaceae. Mycologia 19(4): 188-190.

SCHENK, A. 1858. Über Das Vorkommen Contractiler Zellen im Pflanzenreiche. F.E. Thein, Würzburg. 20 p.

SCHENK, A. 1859a. *Achlyogeton*, eine neue gattung der Mycophyceae. Bot. Zeit. 17(47): 398-400.

SCHENK, A. 1859b. Algologische mittheilungen. Verhandl. Phys.-Med. Gesell. Würzburg 9: 12-31.

SIMPSON, D.P. 1968. Cassell's Latin Dictionary, 5th ed.. Macmillan Publishing Company, New York. xviii + 883 p.

SOROKINE, M.N. 1876. Les végétaux parasites des anguillulae. Ann. Sci. Nat. Bot. (6th series) 4: 62-71.

SOROKINE, M.N. 1883. Aperçu systématique des Chytridiacées récoltées en Russie ét dans L'Asie Centrale. Arch. Bot. Nord. France 2: 1-42.

SPARROW, F.K., Jr. 1939. The entomogenous chytrid *Myrophagus* Thaxter. Mycologia 31(4): 439-444.

SPARROW, F.K., Jr. 1942. A classification of aquatic Phycomycetes. Mycologia 34: 113-116.

SPARROW, F.K., Jr. 1960. Aquatic Phycomycetes, 2nd rev. ed. Univ.Michigan Press, Ann Arbor. xxv + 1187 p.

STEARN, W.T. 1983. Botanical Latin, 3rd. ed., rev. David & Charles Publishers, Newton Abbot, London. xiv + 566 p.

WOLF, F.T. 1944. The Aquatic Oomycetes of Wisconsin, part one. The University of Wisconsin Press, Madison. 64 p.

MYCOTAXON

Volume LXIV, pp. 101-139 September 1997

THE P. A. SACCARDO MYCOLOGICAL HERBARIUM. A CRITICAL REVISION OF THE 1930'S EDITION OF THE CATALOGUE BY G. GOLA. (*)

I – EUBACTERIA, DICTYOSTELIOMYCOTA, MYXOMYCOTA, PLASMODIOPHOROMYCOTA

by

Mario Orsenigo

Department of Biology, University of Milan,
Via Celoria 26, I-20133, Milan (Italy)

Foreword

The mycological herbarium assembled by the Italian Mycologist P. A.. SACCARDO (1845-1920) from the 1870's until his death, is composed by about 70.000 samples, covering more than 18.500 species, at least 4.150 being holotypes or syntypes. The collection was revised several times by Saccardo himself during his life time and until only a few years before his death. On the tenth anniversary of his death, in 1930, G. GOLA published a "descriptive" catalogue covering all of the species of the herbarium and including, for each exsiccatum, the source based on the more than sixty foreign personal or commercial collections, or, when possible, the geographical origin, always maintaining the systematic arrangement of the Saccardo's Sylloge.

In the course of the past 65 years several things have occurred. The Second World War did not cause particular damages to the collection, but the mycological taxonomy was drastically revised more than once and is still largely under revision. Some new accessions were added to the collection, a large number of specimens were sent abroad on loan, and a certain number, especially types, were never sent back .

A revision of the Herbarium was therefore urgent: this is a first approach and it covers only a very small part of the collection. The systematic arrangement was based on the Bergey' s Manual of Systematic Bacteriology and Bergey's Manual

---

(*) Paper n. 1 from : **University of Padua (Italy), Interdepartmental Center of Services, Scientific Museums, *Herbarium Patavinum (PAD),* via Orto Botanico, 15 ; I - 35123, Padova (Italy)** of Determinative Bacteriology (the last editions) for the *Eubacteria*, while the genera and higher taxa of *Myxomycota* are arranged according to Martin & Alexopoulos (1969), Martin, Alexopoulos & Farr (1983), and Hawksworth, Kirk, Sutton & Pegler (1995), and the genera of *Plasmodiophoromycota* according to Karling (1968). Within orders the genera and within genera the species are arranged in alphabetical order.

A PC database program was developed to record the specimens in the herbarium. Each species is identified by a six-digit number, the first two digits correspondig to the order, the third and fouth ones to the genus and the last ones to the species. A small letter identifies the specimen. Therefore, for example, the specimen of *Craterium leucocephalum* (Pers.) Ditmar from the commercial herbarium by Ellis & Everarth, North American Fungi, N° 2695 can be identified and easily recovered by the N° 13.03.01-b. A complete list of digit references for single species and genera, as well as their synonyms are reported in the Index of Scientific Names.

Each specimen was carefully checked in relation to its source, either from foreign personal herbaria or exsiccata, or from different geographical origins, with reference, when possible, to Saccardo's reports in the literature. Credit must be given to Mrs. F. Menegalle Curti, Librarian of the Botanical Garden of the Padua University, who found an original manuscript paper by Saccardo, where he reported the abbreviations used on the labels of the specimens to identify their source: **L.** for Letendre, **B.** for Brunard, **LB.** for Libert, **T.** for Therry, **M.** for Malebranche, **R.** for Roumeguère, etc. It was thus possible to recognize that at least fifty collections, reported by Gola (1930) as of Northern Italian origin ("It. bor."), on the contrary, had their origin in the Herbaria of the contemporary French and Belgian mycologists. For all of them, as well as for the other exsiccata, the literary reference, when possible, has been recorded between square brackets.

Particular attention has been given to **typification**. Gola (1930) reported six types (*T!*) for **Eubacteria** (*Schizomycetes*) and **Myxomycota** (*Myxomycetes*), whereas on the ground of Articles 9, 9A and 10 of the Tokyo Code for Botanical Nomenclature (1994), it was possible to recognize that one of the specimens reported by Gola as type (*T!*) should very likely be discarded, whereas six others must be recognized as **holotypes**, two as **isotypes** and eighteen as **syntypes**.

Authors of plant names are citated as recorded by Brummitt & Powell (1992).

Commercial Herbarium Abbreviations

C.L.	J.J. Therry, Cryptogames du Lyonnays
C.P.	B. Balansa, (Plantes) Cryptogames du Paraguay, 1878-1884
E.C.I.	G. De Notaris et al., Erbario Crittogamico Italiano, 2nd s.,
F.A.E.	H.W. Ravenel, Fungi Americani Exsiccati, 1825-1914
F.B.E.	M.C. Cooke, Fungi Britannici Exsiccati, 1865-1874
F.BV.E.	A. Allescher & J.N. Schnabl, Fungi Bavarici Exsiccati, 1890-1900
F.C.E.	H.W. Ravenel, Fungi Caroliniani Exsiccati, 1852-1860
F.E.	G.I. Rabenhorst & G. Winter, Fungi Europaei et Extraeuropaei Exsiccati, 1881-1886
F.E.P.S.	L. Romell, Fungi Exsiccati Praesertim Scandinavici, 1890, 1895

F.G.E.	C. Roumeguère, Fungi (Selecti) Gallici Exsiccati,1879-1898
F.H.	G. Linhart, Fungi Hungarici, 1882-1886
F.L.E.	F. Cavara,Fungi Longobardiae Exsiccati, 1891-1895
F.P.	G. Briosi & F. Cavara, I Funghi Parassiti delle Piante Coltivate et Utili, Exsiccati, delineati e descritti, 1888-1926
F.P.S.E.	J. Eriksson, Fungi Parasitici Scandinavici Exsiccati, 1882-1895
F.S.G.	J. Kunze, Fungi Selecti Exsiccati, 1877-1881
H.C.B.	G.D. Westendorp & A.C.F. Wallays, Herbier Cryptogamique du Belgie, 1849-1859
H.C.C.O.	F. Fautrey, Herbier Cryptogamique de la Cote d'Or,
H.M.	G.J. Rabenhorst, Klotzschii Herbarium Vivum Mycologicum, 1855-1881
M.-f. B.	J.E. Vize, Micro-Fungi Britannici, 1878-1888
M.D.	R. Ciferri, Mycoflora Domingensis Exsiccata,
M.F.A.F.	C.E. Fairman, Mycotheca Fairmani Adirondack Fungi,
M.G.	H. Sydow, Mycotheca Germanica, 1903-1942
M.I.	D. Saccardo, Mycotheca Italica, 1897-1913
M.U.	F. de Thümen, Mycotheca Universalis, 1875-1884
M.V.	P.A. Saccardo, Mycotheca Veneta, 1874-1881
N.A.F.	J.B. Ellis & T.B.M. Everhart, North American Fungi (I & II ss.), 1878-1898
P.C.A.	M.A. Libert, Plantae Cryptogamicae quas in Arduennae colligit, 1830-1837
P.S.	J. Schröter, Die Pilze Schlesiens, 1882-1908

A - **EUBACTERIA**

01 - *Actinomycetales*

01 - **Actinomyces** Harz

01 - **Actinomyces bovis** Harz
Syll., 8: 928, n. 3658 (sub *Nocardia actinomyces* Trevis.)
Bergey's M.Syst.Bact., pag.1415, 1986
a) M.G., n. 50 (1905); **b)** One specimen is a microscope slide (broken) with the label: "A.b., tumore linguale, Gab. Pat. S. Chir., 4\98, Bassini"
Missing: **c)** one specimen from North Italy.

02 - **Frankia** Brunch.

01 - **Frankia alni** (Woronin) Tubeuf
Syll. 7: 464, n. 1569 (sub *Plasmodiophora alni* (Woronin) Müll.)
Bergey's M.Det.Bact., 8th ed., pag.703, 1974
a) F. P., n. 252 (1896)
GOLA, sub *Frankia subtilis* Brunch.. (Syll. 9:340, n. 1428)
b) M. I., n. 1113 (1902)
c) Cif., M. D., n. 425 (1926)
GOLA, sub *Schinzia alni* Woronin
d) F.L. E., n. 5 (as *Plasmodiophora alni*); **e)** P.S. n. 118 (as *Plasmodiophora alni*) **f)** M.U., n. 425 ; **g)** Herb. de Thuemen, Franconia sub Bayreuth (1875); **h)** F.E., n. 2877 (1880); **i)** G. Cuboni, Conegliano (18??) ; **j)** Herb. C. B. Plowright (1876) ; **k)** S. 77 A (Selva, Padua) [4] ; **l)** Vittorio, 1884

Note: Does "**Appendix**: Gallen von der Wurzeln eines abgestorbenen *Viburnum tinus* L." belong to the Herbarium Rabenhorst-Winter?

02 - *Bacillales*
01 - **Bacillus** Cohn

01 - **Bacillus anthracis** Cohn
Syll., 8: 955, n. 3767
Bergey's M.Syst.Bact., pag. 1130, 1986
a) F.G.E., n. 800 ; b) M.U., n. 1499 ; c) F.H., n. 201

02 - **Bacillus subtilis** (Ehrenb.) Cohn
Syll. 8: 964, n. 3808
Bergey's M.Syst.Bact., pag. 1130, 1986
a) M.U., n. 1200

03 - **Undetermined**
a) *Bacillus* ..., C. F. Baker, Coll. Pl. du Ins. Philipp., n. 3862 (1915). "On *Citrus decumana* (young seedlings)", Los Bañ
os, P.I.

03 - *Clostridiales*
01 - **Clostridium** Prazmowski

01 - **Clostridium butyricum** Prazmowski
Syll. 8: 1003, n. 3974 (sub *C. butyricum* (Pasteur) Prazmowsky)
Bergey's M.Syst.Bact., pag. 1160, 1986
a) M.U., n. 1800

04 - *Eubacteriales*
01 - **Bacterium** Ehrenb.

01 - **Bacterium termo** (Müller) Ehrenb.
Syll. 8: 1024, n. 4062
Bergey's M.Det.Bact., 6th ed., pag. 687, 1948
a) M.U., n. 1000

05 - *Micrococcales*
01 - **Leuconostoc** Tiegh.

01 - **Leuconostoc mesenteroides** (Tsenkovskii) Tiegh.
Syll., 8: 1052, n. 4154
Bergey's M.Syst. Bact., pag. 1074, 1986
a) M.U., n. 2300

02 - **Micrococcus** (Schröt.) Cohn

01 - **Micrococcus aurantiacus** Cohn
Syll. 8: 1051, n. 4153 (sub *Pediococcus aurantiacus* De Toni & Trev.)
Bergey's M.Det.Bact., 6th ed., p.243, 1948
a) M.U., n. 1700
GOLA, sub *Bacterium aurantiacum* (Cohn) Trel.
b) Herb. Wn. Trelease, n.1, Madison (1884) ("on cooked potato").

02 - **Micrococcus bombycis** (Naegeli) Cohn
Syll. 8: 1086, n. 4304 (sub *Micrococcus ? ovatus* (Lib.) Winter)
Bergey's M.Det. Bact., 6th ed., pag.154, 1948
GOLA, sub *Nosema bombycis* Naegeli
a) M.U., n.1300 ; b) M.U., n.1799 (as *M. bombycis* Cohn) ; c) Herb. de Thümen, Istria (in *Bombyce mori*)

03 - **Micrococcus candidus** Cohn
Syll. 8: 1084, n. 4291
Bergey's M.Det. Bact., 7th ed., pag.458, 1957
a) Herb. de Thümem, f. o*vi gallinacei*, Austria inf., Wien, 1879
GOLA, sub *Bacterium candidum* (Cohn) Trel.
b) Herb. Wm. Trelease, n. 5, Madison (1884) ("on cooked potato").

04 - **Micrococcus incarnatus** ??
Syll. (not reported)
Bergey's M. (not reported)
GOLA, sub *Bacterium incarnatum* Trel.
a) Herb. Wm. Trelease, n.2, (1884) ("on cooked potato").

05 - **Micrococcus luteus** (Schröt.) Cohn
Syll. 8, 1083, n. 4287
Bergey's M.Syst.Bact., pag. 1005, 1986
a) M.U., n. 1400
GOLA, sub *Bacterium luteum* Trelease
b) Herb. Wm. Trelease, n.4, Madison (1884) ("on cooked potato")

03 - **Pediococcus** Balcke

01 - **Pediococcus acidilactici** Lindner
Syll. 8: 963, n. 3802 (sub *Bacillus acidi lactici* (Zopf) Schröt.)
Bergey's M.Syst.Bact., pag. 1079, 1986
b) P. A. Saccardo (1906)

04 - **Sarcina** Farl.

01 - **Sarcina litoralis** Paulsen
Syll. 8:, 1049, n. 4146 (sub *Lampropedia littoralis* (Oerst.) De-Toni & Trevis.
Bergey's M.Det.Bact., 7th ed., pag.471, 1957

Bergey's M.Det.Bact., 7th ed., pag.471, 1957
GOLA, sub *Sarcina littoralis* Paulsen
a) One specimen from L. Trabut, Algeri,: "*S. morrhuae*, in Gadis sale servatis. Sec. Zopf status *Beggiotoae roseo-persicinae*" [18]
Note: *S. morrhuae* is *S. m.* Farlow, not S. *morrhuae* Kokur, not *Halococcus litoralis* Schoop, both reported by Bergey's M. Syst. Bact., p.267, 1984, to *Halococcus morrhuae* (Klebhan) Hodgkiss *(Archeabacteria) (Gadius morrhua* is the cod fish)

05 - **Serratia** Bizio

01 - **Serratia marcescens** Bizio
Syll. 8: 976, n. 3859 (sub *Bacillus marcescens* (Bizio) Trevis.)
Bergey's M.Det. Bact., 8th ed., pag.326, 1974
GOLA, sub *Micrococcus prodigiosus* Cohn
a) P.S., n.123 (as *M. prodigiosus* (Ehrenb.)); **b**) M.U., n. 1500 (1879) (as *Monas prodigiosa, Bacteridium prodigiosa*); **c**)*Serratia marcescens* (*Micrococcus prodigiosus, Palmella prodigiosa*), Piove di Padova, Giugno-Luglio 1879.

06 - ***Mycobacteriales***
01 - **Mycobacterium** Lehm. & Neumann

01 - **Mycobacterium tuberculosis** (Zopf) Lehm. & Neumann
Syll. 8: 943, n. 3708
Bergey's M.Syst.Bact., pag. 1438, 1986
GOLA, sub *Bacillus tuberculosis* Koch
a) P.S., n. 205.

07 - ***Myxococcales***
01 - **Crenothrix** Cohn

01 - **Crenothrix polyspora** Cohn
Syll. 8: 925, n. 3650 (sub *C. kuehniana* (Rabenh.) Giard)
Bergey's M.Syst.Bact., pag. 2007, 1986
a) M.U., n. 1600
GOLA, sub *Crenothrix kuehniana* Rabenh.
a) C. F. Baker, Fungi Malayana, n. 278 (1916)

02 - **Leptothrix** Kuetzing

01 - **Leptothrix ochracea** Kuetzing
Syll. 8: 929, n. 3662
Bergey's M.Det.Bact., 8th ed., pag. 131, 1974
GOLA, sub *Detoniella ochracea* (Trevis.) Rottenb.
a) Penzig, Gheleb [26]

03 - **Sphaerotilus** Kuetzing

Syll.8: 927, n. 3656
Bergey's M.Det.Bact, 8th. ed., pag. 129, 1974
GOLA, sub *Cladothrix dichotoma* Cohn
a) Herb. Wm. Trelease, n.6, Cambridge, Mass. (1881) ("Characioid zoogloeae on *Cladophora*") ; **b**) Gasperini, Pisa, "culta in agar", 1889

08 - *Pseudomonadales*

01 **Lamprocystis** Schröt.

01 - **Lamprocystis roseopersicina** (Kuetzing) Schröt.
Syll. 8: 1038, n. 4106
Bergey's M.Det.Bact., 8th ed., 1974
a) as *Beggiotoa roseo-persicina* Zopf ; **b**) from L. Trabut, Algeri, as *Clatrhrocystis roseo-persicina* Cohn (*Protococcus roseus* Kuetz.) [18]

02 - **Pseudomonas** Migula

01 - **Pseudomonas citricola** Smith
Syll. (not reported)
Bergey's M. (not reported)
GOLA, sub *Bacterium acidi lactici* Zopf
a) F.H., n. 101.

02 - **Pseudomonas savastanoi** (Erw.Smith) Stevens
Syll. 8: 982, n. 3882
Bergey's M.Det,Bact., 6th ed., pag. 132, 1948
Bergey's M.Syst.Bact, Pag. 170, 1984
GOLA, sub *Bacillus oleae* Arcang.
a) F.P., n. 101; **b**) M.I., n. 1750; **c**) Isola di Pianosa (1901) [40]

03 - **Pseudomonas syringae** pv. **mori** (Boy. & Lamb.) Young
Bergey's M.Syst. Bact., pag. 170, 1984
GOLA, sub *Bacillus cubonianus* Macch.
a) M.I., n. 1749
GOLA, sub *Bacillus mori* Voglino
b) Voglino, "in foliis *Mori albae* prope Sarche " (1894).

09 - *Spirillales*

01 - **Acetobacter** Beij.

01 - **Acetobacter aceti** (Pasteur) Beij.
Syll.: 8, 1021, n. 4044 (sub *Bacterium aceti* (Kuetz.) Lanzi = *Mycoderma aceti* Pasteur = *Torula aceti* Sacc.)
Bergey's M.Syst.Bact., pag. 270, 1984
GOLA, sub *Bacterium aceti* Thüm.
a) M.U., n. 1599 ; **b**) "*Torula* (*Mycoderma*) *aceti*, in vino acidiscente" (1877) **c**) "funghi sul vin bianco. *Mycoderma aceti*"; **d**) "*Bacterium aceti*, forma

bacillare e leptotricacea, in cremore vini" (1877)

02 - **Rhizobium** Frank

01 - **Rhizobium leguminosarum** (Frank) Frank
Syll. 8: 983, n. 3884 (sub *Bacillus radicicola* Beijerinck)
Bergey's M.Syst.Bact., pag. 240, 1984
GOLA, sub *Bacillus leguminosarum* (Frank.)
a) F.P., n.251; **b**) Herb. Ab. A. Carestia, n.1737 (as *Bacillus radicicola,* corrected to *Rhizobium leguminosarum* [31]
GOLA, sub *Phytomyxa leguminosarum* Frank (Syll 7: 466, n. 1572 sub *P. leguminosarum* (Frank) J Schröt.)
c) Ellis & Everhart, N. A. F., n. 2436 (1879)
GOLA, sub *Schinzia lupini* Thüm. f. *L.lutei* (Syll. 7: 466, n. 1573)
d) Herb. de Thümen, Wurtenberg (1873)

03 - **Spirillum** Ehrenb.

01- **Spirillum eichleri** Sacc.
Syll. (not reported)
Bergey's M. (not reported)
a) Herb. G.Bresadola ("forma strati color rosa nella parte superiore dei tronchi di B*etula alba.* Polonia russa." Eichler) *nomen nudum (?)* [**HOLOTYPE,** fide Gola (1930)]

B - DICTYOSTELIOMYCOTA

I - Dictyosteliomycetes

10 - ***Dictyosteliales***
01 - **Dictyostelium** Bref.

01 - **Dictyostelium sphaerocephalum** (Oudem.) Sacc. & Marchal
Syll., 7: 452, n. 1529
GOLA: sub *Dictyostelium mucoroides* Marchal & Sacc.
a) n. 209, "in fimo murino", Bruxelles (as *Dictyopus mucoroides* Marchal & Sacc.) [17]

C - MYXOMYCOTA

I - Protosteliomycetes

11 - ***Ceratiomyxales*** Martin (ex Martin, Alexopoulos & Farr, 1983)
01 - **Ceratiomyxa** Schröt.
01 - **Ceratiomyxa fruticolosa** (Müll.) Macb.
Syll., 4: 596, n.2851 (sub *Ceratium hydnoides* (Jacq.) Alb. et Schwein.
GOLA: sub *Ceratium arbuscula* B. et Br.
a) Bresadola (as *Isaria arbuscula* Bres.) (*Ceratiomyxa arbuscula,* Alf. Dewevre,

n.22, Semba, Congo, 1896) [32]
GOLA: sub *Ceratium hydnoides* (Jacq.) Alb. et Schwein.
b) F.E., n.572; **c)** Bresadola ; **d)** Colfosco, 1874; **e)** n.211 (as *Monosporium acuminatum*)
GOLA: sub *Ceratium mucidum* (Schröt.) Pers.
f) P.S., n.3 ; **g)** Voegel, Germania (as *Ceratiomyxa mucida* (Pers.) Schröt. *var. rubicunda*),1904.

II - Myxomycetes

12 - *Liceales* Jahn

01 - **Cribraria** Pers.

01 - **Cribraria argillacea** (Pers.) Pers.
Syll. 7: 416, n.1418
a) N. A. F., n. 2899 ; **b)** F.B.E., n. 526 ; **c)** P.S., n. 21 ; **d)** Herb. Plowright (1876) ; **e)** Vallombrosa (1896) [34]

02 - **Cribraria aurantiaca** Schrad.
Syll. 7: 413, n. 1409)
a) P.S., n. 15 ; **b)** Herb. Ab. A. Carestia, n.486, corrected to *C. macrocarpa* [30]

03 - **Cribraria intricata** Schrad.
Syll. 7: 415, n.1415
a) N. A. F., n. 2095 ; **b)** F.C.E., n. 79
GOLA, sub *Cribraria dictyoidea* Cooke et Balf.(mispelled)
c) F.A.E., n. 475 (as *C. dictyodioides* Cooke & Balf.) [**SYNTYPE**, diagnosis in Mass. Monog. Myx., 65, 1902 (fide Stevenson, 1971)]

04 - **Cribraria macrocarpa** Schrad.
Syll. 7: 416, n. 1417
a) N. A.F., n. 2900

05 - **Cribraria tenella** Schrad.
Syll. 7: 414, n. 1411
a) Hortus Botanicus Patavinus [1] ; **b)** N. A. F., n. 1398

02 - **Dictydiaethalium** Rost.

01 - **Dictydiaethalium plumbeum**(Schum.) Rostaf.
Syll.7:408, n.1396 (sub *Clathroptychium rugulosum* Rostaf.)
GOLA, sub *Dictyaethalium plumbeum* Rost. (mispelled)
a) Fautrey, Herb. Crypt. de la Cote d' Or. ; **b)** Montello (1890) (as "*C. rugulosum*, huc *Myxosporium croceum* Sacc.")
GOLA, sub *Clathroptychium rugulosum* Rost.(mispelled)
c) N.A.F., n. 335 ; **d)** Selva, in *Robinia* [2] ; **e)** n.4, " in vite"
GOLA, sub *Clathroptychium cinnabarinum* Sacc.

f) Saccardo [**HOLOTYPE**, latin diagnosis in Michelia, 1: 545, 1879 [6]; Syll. 7: 409, n. 1397]

03 - **Dictydium** Schrad.

01 - **Dictydium cancellatum** (Batsch) Macbr.
Syll. 7: 411, n. 1401 (sub *D. cernuum* (Pers.) Nees)
GOLA, sub *Dictydium cernuum* Pers.
a) P.S., n. 22.
GOLA, sub *Dictydium umbilicatum* Schrad.
b) N.A.F., n. 1122 ; **c)** F.C.E.,n. 78 ; **d)** F.A.E., n. 476 ; **e)** Schemnitz, Prenkow, Russia (1892) [29]

04 - **Licea** Schrad

01 - **Licea guaranitica** Speg.
Syll. 10: 89, n. 4817
GOLA, sub *Tubulina guaranitica* Speg.
a) Balansa, Pl. du Paraguay, 1878-1884, n. 3968, Guarapy, 1883 (as *Tubulina? guaranitica* Speg.)

02 - **Licea operculata** (Wingate) Martin
Syll. 10: 89, n.4816 (sub *Orcadella operculata* Wingate)
GOLA, sub *Orcadella operculata* Wingate
a) N.A.F., n. 2497 [**SYNTYPE**,diagnosis in Acad. Nat.Sci. Phil.,1889: 280, 1899 , fide Stevenson, 1971]
Note: Martin & Alexopoulos, 1969, do not report *L. guaranitica* Speg. but *Tubulina guaranitica* Roum.. as excluded species

05 - **Lindbladia** Fr.

01 - **Lindbladia tubulina** Fr.
Syll. 7: 408, n. 1395
GOLA, sub *Lindbladia effusa* (Ehrenb.) Rostaf.
a) N.A.F., n. 2700
GOLA, sub *Tubulina spermoides* (Berk. & Curtis) Massee
b) Michigan (as *Licea spermoides* Berk. & Curtis)
GOLA, sub *Tubulina fragiformis* Pers.
c) Herb.Ab. Carestia, n.19 (1857) [30] ; **d)** Herb. Cavara, Vallombrosa, 1899 [34]

06 - **Lycogala** Adans.

01 - **Lycogala epidendrum** (L.) Fries
Syll., 7: 435, n. 1484 (sub *L.epidendrum* Buxb.)
GOLA, sub L.*epidendrum* (Fr.) Burb.(mispelled for Buxb.)
a) N.A.F., n. 334 ; **b)** F.S.E., n. 197 (1875) ; **c)** H.C.B., n. 741 ;**d)** P.S.,. n. 36 ; **e)** F.E., n. 2140 (1875) ; **f)** M.I., n. 1322 (1903) ; **g)** F.L.E., n. 151 ; **h)** F.C.E., n. 74 ; **i)** F.H., n. 84 (1882) ; **j)** F.B.E., n. 614 ; **k)** Erb. Ist. Forest. Vallombrosa

(A.Fiori) (1901) ; **l**) E.C.I., s. II, n. 348 ; **m**) Sibiria, n. 1391 (1875) ; **n**) S., 1878 ;**o**) Sermide, Magnaguti, 1867 ; **p**) Trento, 1950 ; **q**) S.Cristina , Reggio Calabria (Piccioli); **r**) Montello, 1872 [1] ; **s**) Cansiglio, 1838 ; **t**) Cansiglio,1898 (Berengèr); **u**) S., 1878 ; **v**) 1874 ; **w**) Allex. ; **x**) Solda, 1875 ; **y**) Padua, n. 37 ; **z**) Monte Cavo

GOLA, sub *Lycogala terrestre* Fr.

aa) F.C.E., n. 78

Missing: **ab**) F.G.E., n. 2813 (as *L. miniatum*)

02 - **Lycogala flavofuscum** (Ehrenb.) Rostaf.
Syll. 7: 436, n. 1485

a) P.S., n. 37 ; **b**) La Thuile (1916) [37] ; **c**) Hortus Botanicus Patavinus, (1891) ; **d**) Zoldo, 1877 [5] ; **e**) G. Berl., 1882

03 - **Lycogala minutum** Sacc. & Paol.
Syll. 7: 436, n. 1486

a) Saccardo [**HOLOTYPE**, latin diagnosis in Atti R. IstitutoVeneto,VI,6:,5,1877]; **b**) a second original specimen (Saccardo) **ISOTYPE**, latin diagnosis loc.cit.]
Note: *species dubia*, according Martin & Alexopoulos (1969)

07 - **Reticularia** Bull.

01 - **Reticularia lycoperdon** Bull.
Syll.: 7, 418, n. 1424

a) P.S., n. 53, **b**) Herb. Ab. A. Carestia, n. 814 (1891) [27]; **c**) Siberia, n. 1386; **d**) Siberia, n. 1398

GOLA, sub *Reticularia umbrina* Fr.

e) Montello, 1873 [1]; **f**) Montello [1]; **g**) Patavii, 1876 (Girotto)

02 - **Reticularia olivacea** (Ehrenb.) Fr.
Syll. 7: 409, n. 1399

GOLA, sub *Enteridium olivaceum* Ehrenb.

a) Herb. Ab. A. Carestia, n. 336 (1863) [30]; **b**) Herb. Ab. A. Carestia, etc. (as *Dictydiaethalium plumbeum* (Schum.) Rostaf.); **c**) Sacc., Montello (*juvenile*) (1890); **d**) Sacc., (1878) (as *Clathroptychium plumbeum* corrected to *E. olivaceum*) [5]

GOLA, sub *Licea olivacea* Fuckel

e) Montello (1878).

03 - **Reticularia splendens** Morgan
Syll. 7: 418, n.1425 (as *Reticularia ? rozeana* Rostaf..)

GOLA, sub *Enteridium rozeanum* (Rostaf.) G.Winter

a) N.A.F., n. 3298.

04 - **Reticularia venulosa** Berk.& M.A.Curtis
Syll. 7: 419, n. 1433

GOLA: sub *Reticularia venosa* B. et C. (a mispelling?).

a) Rick, Fungi Austro-americani, n. 54 (Det. Bresadola, 1904) ["It is *Trichosporium*

(A.Fiori) (1901) ; **l)** E.C.I., s. II, n. 348 ; **m)** Sibiria, n. 1391 (1875) ; **n)** S., 1878 ;**o)** Sermide, Magnaguti, 1867 ; **p)** Trento, 1950 ; **q)** S.Cristina , Reggio Calabria (Piccioli); **r)** Montello, 1872 [1] ; **s)** Cansiglio, 1838 ; **t)** Cansiglio,1898 (Berengèr); **u)** S., 1878 ; **v)** 1874 ; **w)** Allex. ; **x)** Solda, 1875 ; **y)** Padua, n. 37 ; **z)** Monte Cavo

GOLA, sub *Lycogala terrestre* Fr.

aa) F.C.E., n. 78

Missing: **ab)** F.G.E., n. 2813 (as *L. miniatum*)

02 - **Lycogala flavofuscum** (Ehrenb.) Rostaf.

Syll. 7: 436, n. 1485

a) P.S., n. 37 ; **b)** La Thuile (1916) [37] ; **c)** Hortus Botanicus Patavinus, (1891) ; **d)** Zoldo, 1877 [5] ; **e)** G. Berl., 1882

03 - **Lycogala minutum** Sacc. & Paol.

Syll. 7: 436, n. 1486

a) Saccardo [**HOLOTYPE**, latin diagnosis in Atti R. IstitutoVeneto,VI,6:,5,1877]; **b)** a second original specimen (Saccardo) **ISOTYPE**, latin diagnosis loc.cit.]

Note: *species dubia*, according Martin & Alexopoulos (1969)

07 - **Reticularia** Bull.

01 - **Reticularia lycoperdon** Bull.

Syll.: 7, 418, n. 1424

a) P.S., n. 53, **b)** Herb. Ab. A. Carestia, n. 814 (1891) [27]; **c)** Siberia, n. 1386; **d)** Siberia, n. 1398

GOLA, sub *Reticularia umbrina* Fr.

e) Montello, 1873 [1]; **f)** Montello [1]; **g)** Patavii, 1876 (Girotto)

02 - **Reticularia olivacea** (Ehrenb.) Fr.

Syll. 7: 409, n. 1399

GOLA, sub *Enteridium olivaceum* Ehrenb.

a) Herb. Ab. A. Carestia, n. 336 (1863) [30]; **b)** Herb. Ab. A. Carestia, etc. (as *Dictydiaethalium plumbeum* (Schum.) Rostaf.); **c)** Sacc., Montello (*juvenile*) (1890); **d)** Sacc., (1878) (as *Clathroptychium plumbeum* corrected to *E. olivaceum*) [5]

GOLA, sub *Licea olivacea* Fuckel

e) Montello (1878).

03 - **Reticularia splendens** Morgan

Syll. 7: 418, n.1425 (as *Reticularia ? rozeana* Rostaf..)

GOLA, sub *Enteridium rozeanum* (Rostaf.) G.Winter

a) N.A.F., n. 3298.

04 - **Reticularia venulosa** Berk.& M.A.. Curtis

Syll. 7: 419, n. 1433

GOLA: sub *Reticularia venosa* B. et C. (a mispelling?).

a) Rick, Fungi Austro-americani, n. 54 (Det. Bresadola, 1904) ["It is *Trichosporium* *curtisii* Massee *(Hyphomycetes),* **species excluded**, according Martin & Alexopoulos,1969, 71]

08 - **Tubifera** J.F.Gmel.

01 - **Tubifera casparyi** (Rostaf.) Macbr.
Syll. 7: 418, n. 1423
GOLA, sub *Syphoptychium caspary* Rostaf.
a) N.A.F., n.2092.

02 - **Tubifera ferruginosa** (Batsch) J. F. Gmel.
Syll. 7: 406, n. 1391
GOLA, sub *Tubulina cylindrica* Bull.
a) N.A.F. n. 2096 (corrected as *Tubulina fragiformis* Pers.); **b**) F.E., n. 349 (as *Licea cylindrica* Fr.); **c**) P.S., n. 9.
GOLA, sub *Tubulina fragiformis* Pers.
d) F.B.E., n. 528 (as *Licea fragiformis* Fr.)

13 - ***Echinosteliales*** Martin
01 - **Clastoderma** A.Blytt

01 - **Clastoderma debaryanum** A.Blytt
Syll. 10: 88, n. 4814
Syll.. 7: 400, n. 1373 (as *Orthotrichia microcephala* Wingate)
a) N.A.F., n. 2498 (as *Orthotrichia microcephala* Wingate [**SYNTYPE**, fide Stevenson, 1971, diagnosis in J. Mycol., 2: 125, 1889]

14 - ***Trichiales*** Macbride
01 - **Arcyria** H.A.Wigg

01 - **Arcyria cinerea** (Bull.) Pers.
Syll. 7: 427, n. 1459
GOLA, sub *A. cinerea* Bull.
a) P.S., n. 30 ; **b**) Herb. Georg Winter (1874) ; **c**) Lundqvist, n. 3431-b (1962) **d**) Horto Botanico Patavino,(in *Jungermannia* as *A.. cinerea* (Bull.) Schum. *var. cylindracea*) ; **e**) Selva (1875) [4] ; **f**) Ziminello, Sept. 1892 (Penzig?)
GOLA, sub *Arcyria albida* Pers.
g) M. I., n. 1321 (1900)
Missing: **h**) N.A.F., n. 1115

02 - **Arcyria denudata** (L.) Wettst.
Syll. 7: 426, n. 1457
GOLA, sub *Arcyria punicea* Pers.
a) N.A.F., n. 1114 ; **b**) F.H., n. 83 ; **c**) P. S., n. 29 ; **d**) F.E., n.1914 **e**),H.M., n. 671 **f**) F.C.E., n. 80 ; **g**) F.B.E., n. 520 ; **h**) F.G.E., n. 81 ; **i**) Herb. Georg Winter (1874) ; **j**) Herb. J. Schröter, 1877 ; **k**) Cavara, F. Long. Exs., n.4 ; **l**) Herb. Ab. A. Carestia, n. 772 (1891) [30] ; **m**) Mus. Botanicum R. Horti Taurinensis

Herb.Gen, n.6, Mattirolo (1901); **n)** Mus. Botanicum R. Horti Taurinensis Herb. Gen., n.7, Mattirolo (1901) ; **o)** Letendre, 1844 [15] ; **p)** Montello, 1872 [1] ; **q)** Montello, 1874, n.104 [1] ; **r)** Cansiglio, 1874 ; **s)** Selva, n.33 [1] ; **t)** Horto Papafava, Padua [1] ; **u)** France?, 1877 ; **v)** one specimen with no indications
Missing: **w)** H.C.B., n?

03 - **Arcyria globosa** Schwein.
Syll. 7: 433, n. 1479 (as *Lachnobolus globosus* (Schwein.) Rostaf.)
a) N.A.F., n. 1116
GOLA, sub *Lachnobolus globosus* (Schwein.) var. *minor*
b) N.A.F., n. 1397 ("differs from N.A.F. n.116 in its smaller size and almost obsolete receptacles").

04 - **Arcyria incarnata** (Pers.) Pers.
Syll. 7: 433, n. 1472 (as *Lachnobolus incarnatus* (Alb. & Schwein.) Schröt.)
GOLA, sub *Arcyria incurvata* Pest. (mispelled for Pers.)
a) Sibiria, n. 1388 ; **b)** Cansiglio (1878) ; **c)** Padua, n.28, 1872 [1] ; **d)** Selva, 1874
e) Selva, 1875

05 - **Arcyria nutans** (Bull.) Grev.
Syll. 7: 429, n. 1464
a) N.A.F., n. 3598 (**empty envelope!**) ; **b)** F.E., n.421 (1859-1905) ; **c)** P.S., n. 33
d) Queesland (Australia) (as *A. nutans* f. *flava*) [25] ; **e)** Mount Dongollo, Eritrea [26] ; **f)** Montello, n.27 [1]

06 - **Arcyria pomiformis** (Leers) Rostaf.
Syll. 7, 427, n. 1458
GOLA, sub *A. pomiformis* (Roth.) Rost.
a) N.A.F., n. 3497

07 - **Arcyria stipata** (Schwein.) A.Lister
Syll. 22: 812, n. 6064
GOLA, sub *Hemiarcyria stipata* Schwein.
a) Prixton O., A. P. M.

08 - **Arcyria versicolor** W.Phillips
Syll. 7: 432, n. 1474
GOLA, sub *Arcyria vitellina* Philips (mispelled for Phillips)
a) Mt. S. Bernardo

09 - **Undetermined**
a) *Arcyria* 144 (*Cosmariospora*? "forma d'una *Fusarium*? od altra *Tuberculariacea*" Yellowish fibers and spores are described.)

02 - **Hemitrichia** Rostaf.

01 - **Hemitrichia clavata** (Pers.) Rostaf.
Syll. 7: 447, n. 1513 (as *Hemiarcyria clavata* (Pers.) Rostaf.)

GOLA, sub *Hemiarcyria clavata* (Pers.) Rostaf.

a) N.A.F., n. 523 ; **b**) P.S., n. 49 ; **c**) F.G.E., n.44 (as *Trichia clavata*) [10, as *H. clavata*] ; **d**) Herb. W. G. Farlow ; **e**) Cansiglio, Berengèr, 1846 (as *Trichia nigripes* Pers.) [1] ; **f**) Massalongo (as *Arcyria punicea*) ; **g**) Sibiria 1387 (Minussisk, Martianoff?) ; **h**) Horto Botanico Patavino (H. B. P.), 1912 ; **i**) Montello, 1872 [2]

02 - **Hemitrichia serpula** (Scop.) Rostaf.
Syll. 7: 448, n. 1514
GOLA, sub *Hemiarcyria serpula* Scop.

a) N.A.F., n. 2499 ; **b**) "in Vite sp. nova" [as *Trichia serpula* (Scop.)] ; **c**) Feletto, (as *Trichia serpula* b. *reticulata*) [1] ; **d**) Conegliano, 1876 ; **e**) 1868 (as *Arcyria reticulata*)

03 - **Metatrichia** Ing

01 - **Metatrichia vesparium** (Batsch) Nann.-Bremek.
Syll. 7: 447, n. 1512
GOLA, sub *Hemiarcyria rubiformis* Pers.

a) N.A.F., n. 1113 ; **b**) P.S., n. 48 ; **c**) F.C.E.,n. 81 ; **d**) Libert 1009 [13] [15] ; **e**) n.69 ; **f**) Selva, 1874 ; **g**) "Platano" as *Trichia pyriformis* Hoffm. ; **h**) Cansiglio, 1874 [2]

04 - **Oligonema** Rostaf.

01 - **Oligonema schweinitzii** (Berk.) Martin
Syll. 7: 437, n.1490 (as *Oligonema bavaricum* (Thüm.) Balf. & Berl.)
Syll. 7: 437, n.1488 (as *Oligonema nitens* (Lib.) Rostaf.)
GOLA, as *Oligonema nitens* Thüm.

a) Herb. de Thümen [as *Oligonema nitens* (Lib.) Rostaf. (*Trichia inconspicua* Rostaf.)]

GOLA, as *Trichia bavarica* Thüm.

b) M.U., n.1497 (as *Trichia bavarica* Thüm., n.sp., 1876 (*Oligonema nitens* Rostaf.,1825 = *Trichia nitens* Lib.,1834)), legit de Thümen)[**SYNTYPE**, latin diagnosis on label]

05 - **Perichaena** Fr.

01 - **Perichaena chrysosperma** (Currey) A. Lister
Syll. 7: 424, n. 1454 (as *Cornuvia wrightii* (Berk. & Curtis) Rostaf.
GOLA, sub *Cornuvia wrightii* B. C.

a) Prixton O., A. P. M.

02 - **Perichaena corticalis** (Batsch) Rostaf.
Syll. 7: 420, n. 1435
GOLA, sub *P. corticalis* Batsch

a) P.S., n.23; **b**) F.G.E., n.42 (as *Licea circumscissa* Pers.f. *pannosa*) [11]
c) Letendre [10]; **d**) Panizzi (S.Remo); **e**) Montello [21] as *Perichena fusco-atra*

(Sibth.) Rostaf.
GOLA, sub *Perichaena populina* Fr.
f) F.C.E., n.82 (as *Licea artocreas* Berk. & Ravenel) [**SYNTYPE**, *nomen nudum* changed to *Perichaena artocreas* Berk. & Ravenel, in Berk. Grev., 2: 68,1873, fide Stevenson, 1971] ; **g**) Herb.Georg Winter (Leipzig, 1874) ; **h**) Herb. Georg Winter, n.14 (1873) ; **i**) Herb. Bresadola, n.3 ; **j**) Herb. Ab. A. Carestia, n.96 bis (1895) [30] ; **k**) Herb. Plowright ; **l**) on *Populus fastigiata*, n.527

03 - **Perichaena depressa** Lib.
Syll. 7: 420, n. 1434
a) N.A.F., n. 1218 ; **b**) M.V., n. 500 (1875) ; **c**) n.32 (1873-74) [2] ; **d**) n.42 (1873-74) [2] ; **e**) S(acc.), 1875
GOLA, sub *Hemiarcyria circumscissa* (Wall.) Rut.
f) Verona, 1889 (C.Massalongo), as "*Cornuvia*, *Hemitrichia* indeterminabile", "*T.circumscissa* (Wall.) Rut. (Rost.?)".
GOLA, sub *Stegasma australe* Ces.
g) F.E., n. 1865 (Cesati) [**SYNTYPE**, latin diagnosis on label and in Hedwigia, 13: 186, 1874]

04 - **Perichaena strobilina** Fr.
Syll. 7: 406, (as *Licea strobilina* Alb. & Schw.)
a) Dr.Bail, Herb. Mycologicum Typicum, n. 201 (1859) [Saccardo quotes: "*P.s.*est *Aecidium strobilinum* seu *Pleosporopsis strobilina*.Cfr. Syll. *Sphaerops*. p.963"] (Species to be excluded according Martin & Alexopoulos, 1969).

05 - **Perichaena vermicularis** (Schwein.) Rostaf.
Syll. 7: 421, n. 1437
GOLA, sub *Perichaena variabilis* Rost.
a) N.A.F., n.726 (1881) [as *Ophiotheca umbrina* Berk. & Curt. (Syll. 7: 421, n.1440)] ; **b**) H.C.C.O., n.113 (1901).

06 - **Trichia** Haller

01 - **Trichia botrytis** (J. F. Gmel.) Pers.
Syll. 7: 440, n. 1494
a) P.S., n. 39 ; **b**) Herb. Ab. A. Carestia, n. 639 (1880) ; **c**) Herb. Ab. A. Carestia, n. 659 (1880) [30]
GOLA, sub *Trichia fragilis* (Sowerby) Rostaf.
d) N.A.F., n. 2097 (f. *simplex*) ; **e**) M.G., n. 450 (1903)

02 - **Trichia contorta** (Ditmar) Rostaf.
Syll. 7: 444, n. 1503
GOLA, sub *Trichia affinis* De By.
a) F.E., n. 2692 (as *Hemitrichia contorta*)

03 - **Trichia decipiens** (Pers.) Macbr.
Syll. 7: 439, n. 1493
GOLA, as *Trichia fallax* Pers.

a) N.A.F., n. 3400 ; **b)** M.U. n. 1999 (1880) ; **c)** F.G.E., n. 142 [11] ; **d)** F.E.P.S., n. 98 (1889) ; **e)** Libert 560, immature [16] ; **f)** Roumeguère, 266 ; **g)** Vizzavona, Corse (n.11),1901 ; **h)** Cansiglio (Berengèr) ; **i)** Cansiglio, 1874 ; **j)** "Cadore ??"

04 - **Trichia erecta** Rex
Syll. 10: 94, n. 4842

a) N.A.F., n. 2496 [**SYNTYPE**, diagnosis in Proc. Acad. Nat.Sci. Phil., 1890: 93, 1890, fide Stevenson, 1971]

05 - **Trichia favoginea** (Batsch) Pers.
Syll. 7: 442, n. 1498 (as *T. chrysosperma* (Bull.) De C.)
GOLA, sub *Trichia affinis* De By.

a) M.U.(Reliquiae Libertianae), n. 2000 ; **b)** Herb.Müller, Mount Zeehan, Australia (Fitzgerald), as *T. karlbreyeri* Massee.[27]

GOLA, sub *Trichia chrysosperma* De C.

c) N.A.F., n. 1112 (as *T. chrysosperma* Bull.) ; **d)** M.U., n. 399 (1875) ; **e)** F.B.E., n.524 (as *T. chrysosperma* Bull.) ; **f)** F.B.E., n.527 (as *T. chrysosperma* De C.) **g)** P.C.A., fasc. III (n.1834), n.277 (as *T. nitens* Pers., corrected to *T. chrysosperma* (Bull.) Dd C.) [20] ; **h)** P.S, n. 42 , **i)** M.-f.B., n. 304 ; **j)** Herb. Georg Winter, n. 373 ; **k)** Sibiria, n.1392 (Minussinsk, Martianoff) ; **l)** Sibiria, n.1393 (Minussinsk, Martianoff) ; **m)** Libert 382 [13] [15] ; **n)** Libert 384 [13] [15] ; **o)** Libert 1010 (as *T. chrysosperma * turbinata*) [13] [15]

GOLA, sub *Trichia ferruginea*

p) Vallombrosa, " *Trichia favoginea (?), tipica*" [34]

Note: GOLA (1930) reports it as being **TYPE** (*T!*) [**Holotype**] and therefore it should be read as *Trichia ferruginea* Sacc. & Cav.(*nomen nudum*) but more likely the label has been mispelled for *T.favoginea*.

GOLA, sub *Trichia persimilis* Karst.

q) Herb. Ab. A. Carestia, n. 1137 (1891) [30] ; **r)** Cansiglio, 1874, as *T. jackii* Rostaf. [2] ;**s)** Cansiglio, 1874 ; **t)** Cansiglio 1874 ; **u)** Cansiglio, 1874 ; **v)** 1876, as *T. jakii* Rostaf.

GOLA, sub *Trichia proximella* Karst.

w) N.A.F., n. 2690 (corrected to *T. persimilis)*

06 - **Trichia floriformis** (Schwein.) G. Lister
Syll. 7: 440, n. 1494 (as *Trichia fragilis* (Sowerby) Rostaf.)
GOLA, sub *Trichia fragilis* (Sowerby) Rostaf.

a) N.A.F., n. 2098 (as *Trichia fragilis* f. *botrytis*).

07 - **Trichia scabra** Rostaf.
Syll. 7: 444, n. 1501

a) N.A.F., n. 2100 ; **b)** M.G., n. 548 (1905) ; **c)** Roumeguère, 76 bis [12] ; **d)** Cansiglio, 1874 [2] ; **e)** Montello, n.13 [2] ; **f)** n.72 ? ; **g)** n.13 ? ; **h)** Brunard ?

08 - **Trichia subfusca** Rex
Syll. 7: 440, n. 1494 (as *Trichia fragilis* (Sowerby) Rostaf.)
GOLA, sub *Trichia botrytis* Pers.

a) N.A.F., n. 2495 (as *Trichia botrytis* Pers., corrected to *Trichia botrtytis var. subfusca* (Rex) A. Lister (*Trichia subfusca* Rex, n.sp., dr. Gev. A. Rex)

[**SYNTYPE**, diagnosis in Proc. Acad. Nat. Sci. Phil., 1890: 192-193, 1890, fide Stevenson, 1971]

09 - **Trichia varia** (Pers.) Pers.
Syll. 7: 442, n. 1497 (as *Trichia persimilis var. nigripes* Rostaf.)
a) M.G., n. 549 (1905) ; **b)** N.A.F., n. 2099 ; **c)** F.E., n. 2137 (1875).; **d)** P.S., n. 41 **e)** F.H., n. 82 (1882) ; **f)** F.G.E., n. 1315 (as *T.chrysosperma* Bull, corrected to *T.varia* Pers.); **g)** F.B.E., n. 615 ; **h)** M.I., n. 931 (1902) ; **i)** Herb. J. Schröter (1877) , **j)** Herb. Georg Winter (?), n. 422 ; **k)** Herb. Ab. A. Carestia, n. 623 (1871) [30] ; **l)** Sibiria, Minussinsk (Martianoff) [9] ; **m)** Roumeguère 76 [12] ; **n)** Libert, 391 [15] ; **o)** Montello, Treviso, 1874 [2] ; **p)** Coimbra [23] ; **q)** Padua, 1877 ; **r)** PIIPPO (??)

Note: the last one is reported exactly as printed on the label; ink colour and character types seem to be the same used for the Herb. De Notaris (DNTRS), but we were unable to identify any possible Author.

GOLA, sub *Trichia nigripes* Pers.
s) F.E., n. 2138.

10 - **Undetermined**
a) *Trichia*, Herb. A. F. Möller (Coimbra), n.779; **b)** *Trichia* ?, Herbarium E. Levier, Vera Cruz (Mexico) (1881), legit Sartorius.

15 - ***Physarales*** Macbr.
01 - **Badhamia** Berk

01 - **Badhamia apiculispora** (Härk.) U. Eliass. & Lundq.
cfr. Eliasson & Lundqvist, in Botaniska Notiser 132 (4) : 560, 1979
a) Lundqvist, n. 5621-a (1968) (as *B. ovispora* Racib.)

02 - **Badhamia capsulifera** (Bull.) Berk.
Syll. 7: 332, n. 1150
GOLA, sub *Badhamia hyalina* (Pers.) Berk.
a) N.A.F., n. 1214 ; **b)** F.E., n. 2689 ; **c)** Brunard (Seines) [11] ; **d)** Magnaguti, Faenza ; **e)** Vicenza (doct. Allexich!) [2] ; **f)** Selva, 1873 ; **g)** Selva, 1876 ; **h)** Selva, 1878 ; **i)** Selva, 1878 : **j)** Selva, 1896

03 - **Badhamia lilacina** (Fr.) Rostaf.
Syll. 7: 334, n. 1156
GOLA, sub *B. lilacina* Fr.
a) N.A.F., n. 2494

04 - **Badhamia macrocarpa** (Ces.) Rostaf.
Syll. 7: 330, n. 1144
a) S(acc.) 80.10, n.54 ; **b)** P.A. Saccardo, Herbarium Tarvisinum, n.18 (1862); **c)** Mase', 1883 [2]
GOLA, sub *Didymium macrocarpum* Rostaf.
d) F.E., n. 2690

05 - **Badhamia nitens** Berk.
Syll. 7: 335, n.11.62 (as *Badhamia inaurata* Curr.)
a) LB 389 (Libert)
GOLA, sub *Badhamia inacervata* Can. **(!!!)**
b) Magnaguti, Sermide (Mantova), 1878 [6] ; **c**) Roumeguère, 265 [12]

06 - **Badhamia obovata** (Peck.) S.J. Sm.
Syll. 7: 334, n.1158 [as *B. rubiginosa* (Chev.) Cooke]
GOLA, as *Badhamia rubiginosa* (Chev.) Rostaf.
a) N.A.F., n. 1215 (1883) ; **b**) Fungi Schemnitzienses, n. 21 (1890) [29]

07 - **Badhamia panicea** (Fr.) Rostaf.
Syll. 7: 330, n. 1141
GOLA, sub *Badhamia punicea* Rostaf.
a) F.L.E., n.201 (as *Physarum contextum* Pers., corrected by D. Saccardo to *Badhamia panicea* Rostaf.)

08 - **Badhamia utricularis** (Bull.) Berk.
Syll. 7: 331, n. 1149
a) F.L.E., n. 1 ; **b**) P. A. Saccardo ("in horto Papafava", 1873) [2] ; **c**) Magnaguti, Faenza(1872).

09 - **Undetermined**
a) *Badhamia.....*

02 - **Craterium** Trent.

01 - **Craterium leucocephalum** (Pers.) Ditmar
Syll. 7: 356, n. 1238
GOLA, sub *C. leucocephalum* Pers.
a) N.A.F., n. 1400 ; **b**) N.A.F., n. 2695 ; **c**) F.E., n. 2674 (as *Craterium turbinatum*) **d**) P.S.,n. 90 ; **e**) M.I., n. 1518 ; **f**) Libert, 388 [13] [15] ; **g**) Padua, 1872 (as *Physarum subulatum* Schumach.) [1] ; **h**) Saccardo (1873) [2] ; **i**) Selva, 1875 ; **j**) Penzig, Acireale (Sicilia), n. 89, 1892
GOLA, sub *Physarum scorpioides* Cke & Balf.
k) F.A.E., n. 480, as *Physarum scyphoides* Cooke & Balf. [**SYNTYPE**, diagnosis in Mass. Jour.Myc., 5: 186, 1889 (fide Stevenson, 1971)]

02 - **Craterium minutum** (Leers) Fr.
Syll. 7: 356, n. 1236
GOLA, as *C. minutum* Fr.
a) N.A.F., n. 2500 ; **b**) F.B.E., n. 208 ; **c**) Herb. de Thümen (1876) ; **d**) Libert, 455 [15] ; **e**) Letendre, 504 [10]
GOLA, sub *Craterium pedunculatum* Trent. (Syll.7: 355, n.1233)
f) Fungi Schemnitzienses (1897) ; **g**) M.I., n. 928 ; **h**) F.G.E., n. 1312 (as *C.minutum* (Leers) Fr.) ; **i**) P.S., 88 ; **j**) Selva, n. 498, 1875 [3] ; **k**) " Strada privata", 1878
Missing: **l**) M.V. n. 498

03 - **Undetermined**:
a) *Craterium*...., Libert, 379

03 - **Diachea** Fries

01 - **Diachea leucopodia** (Bull.) Rostaf.
Syll. 7: 387, n. 1335
a) M.G., n. 113 (1903) ; **b)** P.S., n. 65 ; **c)** C.P., n.4109 (1883) ; **d)** C.P., n.4109 (1884) ; **e)** Conegliano, Cuboni [21]
GOLA, as *Diachea elegans* Fr.
f) F.C.E., n. 80 ; **g)** N.A.F., n. 336 ; **h)** H.C.B., n. 1260 ; **i)** Herb. Niessl, Gratz ; **j)** Herb. Prof. W. Voss

04 -**Diderma** Pers.

01 - **Diderma floriforme** (Bull.) Pers.
Syll. 7: 372, n. 1285
GOLA, sub *Chondrioderma floriforme* Bull.
a) N.A.F., n. 1121.

02 - **Diderma globosum** Pers.
Syll. 7: 370, n. 1278
GOLA, sub *Chondrioderma globosum* Rost.
a) F.G.E., n. 243 (1878) (as *Diderma candidum* Schrad., corrected in *Diderma globosum* Pers. *pr.p.* f. *pannosa*) [11] ; **b)** Herb. Ab. A. Carestia, n. 1304 (1893) [30]

03 - **Diderma hemisphaericum** (Bull.) Hornem.
Syll. 7: 367, n. 1268
GOLA, as *Chondrioderma michelii* (Lib.) Rostaf.
a) F.L.E., n. 51 ; **b)** P.C.A., fasc.II (1832), n. 180 [20] ; **c)** N.A.F., n. 615 ; **d)** F.E., n. 2691 ; **e)** C.L., n. 5661 (1881) [13] ; **f)** Bologna?

04 - **Diderma spumarioides** (Fr.) Fr.
Syll. 7: 367, n. 1269
GOLA, sub *Chondrioderma spumarioides* (Fr.) Rostaf.
a) P.S., n. 75 ; **b)** Herb. Ab. A. Carestia n. 207 pr.p. (1895) (as *Physarum cinereum* Pers.) [30] ; **c)** Morthieu, Neuchatel (Suisse)(1882) ; **d)** Penzig (?), Palermo, Sicily (1908) ; **e)** Monte Bondone, Trento (1897) ; **f)** One specimen as *Spumaria alba* corrected in *Condrioderma spumarioides* ,1879 ; **g)** Motta, Tarvisium (Berengèr!) (as *Carcerina spumarioides* Fr.) [1] ; **h)** H.B.P. (Hortus Botanicus Patavinus)

05 - **Diderma testaceum** (Schrad.) Pers.
Syll. 7: 369, n. 1274
GOLA, as *Chondrioderma testaceum* Schrad.
a) N.A.F., n. 2093 ; **b)** P.S., n. 83

06 - **Diderma trevelyani** (Grev.) Fr.
Syll. 7: 373, n.1289 (as *Chondrioderma trevelyani* (Grev.) Rost.
Syll.10: 86, n.4809 (as *Didymium subcastaneum* Romell)
a) F.E.P.S., n. 100 (1885), as *Didymium subcastaneum* Romell [**SYNTYPE**, latin diagnosis on label]

05 -**Didymium** Schrad.

01 - **Didymium clavus** (Alb.& Schwein.) Rabenh.
Syll. 7: 377, n.1299
GOLA, as *D. clavus* A. et S.
a) N.A.F., n. 2091

02 - **Didymium difforme**(Pers.) Gray
Syll. 7: 371, n.1282 (as *Chondrioderma difforme* (Pers.) Rostaf.)
a) Lundqvist , n. 2801-c (1960)
All the following sub *Chondrioderma difforme*:
b) E.Vize, M.-f. B., n. 303; **c)** N.A.F., n. 1217 ; **d)** P.S., n. 79 ; **e)** C.L., n.5119 (1880) [9] ; **f)** C.L., n.6265 ; **g)** P.C.A., fasc.III, n.276 (1834) [20]; **h)** F.G.E., n. 1311 (1881) ; **i)** D. Saccardo, Horto Botanico Patavino (1896) ; **j)** Fungi Schemnitzienses (1897) ; **k)** LB 343 (Libert) [15] ; **l)** LB 385 (Libert) [15] ; **m)** LB 390 (Libert) ; **n)** Magnaguti, Mantova, 1876 ; **o)** Bizzozzero, Vette di Feltre [7] ; **q)** "in ramis *Mori* ", n.24 ; **r)** S., 1880

03 - **Didymium iridis** (Ditmar) Fr.
Syll. 7: 380, n.1308
GOLA, sub *Didymium proximum* B.& C.
a) Prixton O., A. P. M.
GOLA, sub *Didymium xanthopus* Fr.
b) N.A.F., n.412 (1879) ; **d)** M.I., n. 1521 (1904) (as *D. nigripes* f. *xanthopus* Fr.); **c)** Herb. W. G. Farlow.

04 - **Didymium megalosporum** Berk &.M.A . Curtis
Syll. 7: 383, n.1314
GOLA, sub *Didymium eximium* Peck
a) N.A.F., n. 2493 ; **b)** N.A.F., n. 2089 (corrected as *Didymium nigripes* Fr. f. *eximium*) ; **c)** Selva n.39

05 - **Didymium melanospermum**(Pers.) Macbr.
Syll. 7: 381, n.1309 (as *D. farinaceum* Schrad.)
GOLA, as *Didymium fairmani* Sacc.(Syll.10:86,n.4805)
a) Saccardo ("legit D.C.E. Fairman, on *Smilacina bifolia*, Londonville, N.Y.,U.S.A., August 5th, 1886") [**HOLOTYPE**, latin diagnosis in Jour. Myc., 5: 78, 1889]
GOLA, as *Didymium farinaceum* Schrad.
b) N.A.F., n.2689 ; **c)** F.G.E., n. 1313 (1880) (as *Physarum didermoides* (Arch.) Rostaf.) ; **d)** P.S., n. 69 ; **e)** F.E., n. 423 ; **f)** M.I., n.342 (1896) ; **g)** M.I., n.127 (1897) ; **h)** F.B.E., n. 521 ; **i)** Herb. Ab. A. Carestia, n. 1414 (1895) [30] ; **j)** LB 381 (Libert) [13] [15] ; **k)** LB 464 (Libert) [13] [15] ; **l)** LB 467 (Libert)

[13] [15] ; **m)** Magnaguti,Faenza, 1876 ; **n)** Horto Botanico Patavino, n.25, 1872/73 [2]

GOLA, as *Physarum farinaceum* Pers.

o) Therry 1525 ; **p)** Therry 1526

GOLA, as *Physarum cinereum* (Batsch) Pers.

q) N.A.F., n.2085

06 - **Didymium nigripes** (Link) Fr.

Syll. 7: 382, n. 1310 (as *D. microcarpum* (Fr.) Rost.)

GOLA, sub *D. nigripes* Fr

a) M.I., n.128 (1897) ; **b)** P. A. Saccardo, Selva (1875) (as *D. nigripes* Fr. *genuinum*) [1]

GOLA, sub *Didymium microcarpum* Rostaf.

c) N.A.F., n.1393 (as *Didymium microcarpon* Fr. v. *nigripes*) ; **d)** M.U., n. 999 (1875) ; **e)** Ravenel, ex herb. de Thüm. ; **f)** Ravenel [9] ; **g)** LB 466 (Libert) as *Didymium microcarpon* (Fr.) Chev. [13] [15]

07 - **Didymium serpula** Fr.

Syll. 7: 376, n. 1297

GOLA, sub *Didymium complanatum* Rostaf.

a) C.L., n. 5027 (1880) [12]

08 - **Didymium squamulosum** (Alb. & Schwein.) Fr.

Syll. 7: 377, n. 1301

GOLA, sub *D. squamulosum* Fr.

a) N.A.F., n.1216 (as *D. squamulosum var. leucopus*) ; **b)** M.-f.B., n.305 ; **c)** M.-f. B., n.306 ; **d)** F.B.E., n. 613 ; **e)** P.S., n. 71 ; **f)** Herb. Baker, Coll. Pl. Ins. Philipp. (as *D. squamulosum var. sessile*), Los Banos, n.3810 [36] ; **g)** Herb. A. F. Möller, Cerca de S. Bento, p. Coimbra, 1891 [28] ; **h)** Nordin, n.269-e (1961) ; **i)** Siberia 1388 ; **j)** France 1102

GOLA, sub *Didymium capsulifer* B.

k) F.B.E., n.206 (as *Badhamia capsulifera*) ; **l)** L.Brittain (?), n.101 (1871)

GOLA, sub *Didymium costatum* Fr.

m) F.G.E., n.1212

GOLA, sub *Didymium effusum* Link

n) F.B.E.,. n.300 (as *Chondrioderma cookey* Rostaf.) ; **o)** M.-f.B., n.1 (as *Physarum tussilaginis* Br. & Br.) ; **p)** F.P., 1878-1884, n. 3762 ; **q)** F.L.E., n. 101 (as *D. squamulosum*) ; **r)** M.U., n. 1100 (1872) (as *Chondrioderma cookey* Rostaf.) ; **s)** E.C.I., S.II,n. 43 (1866) (as *D. physaroides* Alb. & Schwein.) ;**t)** H.C.C.O., (1900) **u)** D.Saccardo, 1879 ; **v)** D.Saccardo, 1902 ; w) Mattirolo n.10, 1917

GOLA, sub *Didymium fuckelianum* Rostaf. (Syll.7:380.n.1307)

z) N.A.F., n.2090 (1885).

Missing **: x)** P.S., n.? ; **y)** F.B.E., n.?

09 - **Undetermined**

a) - *Didymium lisimachiae nummulariae* (no other indication!)

06 - **Fuligo** Hall

01 - **Fuligo cinerea** (Schwein.) Morgan
Syll.7: 355, n.1232 (as *Aethaliopsis stercorariformis* Zopf)
GOLA, as *Fuligo stercoriformis* Zopf
a) Penzig, Gheleb (as *Aethaliopsis stercorariformis* Zopf.) [26]

02 - **Fuligo septica** (L.) F. H. Wigg.
Syll. 7: 353, n.1228
a) N.A.F., n. 3200 (1894) ; **b**) F.L.E., n. 251 ; **c**) M.F.A.F., n.14 (1911) ; **d**) M.I., n. 1748 (1906) ; **e**) P.S., n. 116 ; **f**) F.S.E., n.298 (1875) (as *F. septica* (L.) Haller, f *vaporaria* (Bull.) Fr.) ; **g**) M.U., n. 400 (1875) (as *Aethalium vaporarium* Fr.) **h**) ex Herb. de Thümen, Boemia ; **i**) P. A. Saccardo, n.84 (Australia) ; **j**) Baldrati, n.103, Dongollo, Eritrea, 1916 [38] ; **k**) LB 405 (Libert) (as *Aethalium septicum*) [13] [15] ; **l**) Padua (as *Aethalium vaporarium*) [1] ; **m**) Padua, 1876 (as *Aethalium septicum*) [1] ; **n**) Orto Botanico, 1906 (as *Aethalium* (*Fuligo*) *septicum*).
GOLA, sub *Fuligo varians* Sommf.
o) Herb. de Thümen (1875) ; **p**) Australia (O. Tepper, F.Ludwig, n.13) [24] ; **q**) Brazil, 3317 (cfr. Speg. Guar. II, pag. 15) ; **r**) Vittorio, 1874 ; **s**) Vicetia, n.2 (Allessitch)
GOLA, as *Aethalium septicum* Lk.
t) Legit O. Mattirolo, n.7A (1918)

03 - **Undetermined**
a) "*Aethalium* aut *Diphtarium*",*Castanea* (Colfosco), *Catalpa* (Conegliano) Sacc.83 **b**) "*Fuligo, Aethalium*", on label of *Albugo tragopogonis* (Pers) S. F. Gray, F.B.E., n .461

07 - **Leocarpus** Link

01 - **Leocarpus fragilis** (Dicks.) Rostaf.
Syll. 7: 358, n. 1242
a) N.A.F., n. 1123 ; **b**) P.S., n. 87 ; **c**) P.C.A., Fasc. I, n.76 (1830) (as *Diderma vernicosum* , corrected to *L. fragilis*) [20] ; **d**) O. Mattirolo (1900)
GOLA, sub *Leocarpus vernicosum* Pers.
e) F.C.E., n. 78 ; **f**) H.C.B., n. 1063 (as *Diderma vernicosum*)

08 - **Lepidoderma** de Bary

01 - **Lepidoderma granuliferum** (Phill.) R.E. Fr.
Syll. 7: 401, n. 1376
GOLA, sub *Amaurochaete minor* Sacc. & Ell.
a) Saccardo [**HOLOTYPE**, label with drawings; latin diagnosis in Michelia, 2: 566, 1882 [14]

02 - **Lepidoderma tigrinum** (Schrad.) Rostaf.
Syll. 7: 386, n. 1332
a) Herb. Ab. A, Carestia, n. 292 (1863) [30]
Syll. 7: 388, n. 1338 (as *Spumaria alba* (Bull.) D.C.)

GOLA, as *Didymium spumarioides* Fr.

a) Herb. Möller, Coimbra (1894)

GOLA, as *Spumaria alba* (Bull.) D.C.

b) F.H., n. 81 (1882) ; **c**) P.C.A., fasc.II, n. 179 (1832) [20] ; **d**) F.S.E., n. 198 (1875) ; **e**) P.S., n. 66 ; **f**) Belli, S.Pietro v. Capoterra, 1904 (as *Spumaria alba var. sardou*) ; **g**) Padua, n. 57 (as *Spumaria mucilago* Pers.) [1] ; **h**) Belluno.

10 - **Physarella** Peck

01 - **Physarella oblonga** (Berk.& Curt.) Morgan

Syll. 7: 352, n. 1227

GOLA, as *Physarella mirabilis* Peck

a) N.A.F., n. 1212 ; **b**) N.A.F., n. 1399 (as *Tilmadoche oblonga* (Berk.& Curt.) Rostaf.).

11 - **Physarum** Pers.

01 - **Physarum bivalve** Pers.

Syll. 7: 347, n. 1198 (as *P.sinuosum* (Bull.) Rostaf.)

a) F.E., n.1913 (as *Physarum sinuosum* Weinm. Fr.) ; **b**) Herb. Niessl, Brunn (Moravia) ; **c**) Herb. Ab. A. Carestia, n. 1550 pr.p. (1897) [31]

GOLA, as *Physarum sinuosum* (Bull.) Rostaf.

d) M.G., n. 33 (1903) ; **e**) N.A.F., n. 1394 ; **f**) H.M., n. 761 (as *Angioridium sinuosum* (Bull.) Grev.

Note: Specimen n.1550 of the Herb.Ab.A.Carestia is reported by Saccardo & Bresadola [31] as "*pr.p.*", as well as *Diderma lyallii* (Massee) Mcbr. (as *Chondrioderma lyallii* Massee), specimen n.1550 "*pr.p.*" (1897), and *Diderma niveum* (Rost.) Mcbr. (as *Chondioderma niveum* Rost.), specimen n. 1550 "*pr.p.*" (1899). No single specimen of the two last species is however present.

02 - **Physarum cinereum** (Batsch) Pers.

Syll. 7: 344, n. 1189

a) N.A.F., n. 2691 ; **b**) N.A.F., n. 3496 ; **c**) M.I., n. 341 (1897) ; **d**) M.I., n. 930 (1901) ; **e**) M.I., n.1114 (1902) (as *f. herbicola*) ; **f**) P.S., n. 95 ; **g**) M.U., n. 1598 (1879) ; **h**) F.G.E., n. 43 (as *Physarum hyalinum* Pers. f *pannosum*) [11] ; **i**) Herb. Ab. A. Carestia, n. 207 p.p.[30]

Note: The original label records: "*Physarum cinereum* et *Condrioderma globosum*,(correctet to *spumarioides*) [*Stemonitis Carestiae* Ces. et De N. Erb.Critt.Ital. 888 (è Carestia in litteris] Riva Valdobbia: 1 Maggio 1861. Sulle erbe e sugli arbusti schiacciati sotto le nevi invernali. Mihi videtur *Chondrioderma spumarioides* (Fr.) R."

j) Trotter, Avellino (1911) [40] ; **k**) LB 380 (Libert) [4] [15] ; **l**) LB 387 (Libert) [15] ; **m**) Selva, 1878 ; **n**) Magnaguti, Sermide, 1876 ; **o**) Letendre 528 [10] ; **q**) S., 1880 ; **r**) Sacc., 1880 ??

GOLA, as *Didymium cinereum* Morg.

s) F.C.E., n.79 (as *Didymium cinereum* Batsch.) ; **t**) F.C.E., n.83 (as *Didymium cinereum* Fr. var.....) ; **u**) Roumeguère, n. 177 (as *Didimium cinereum* (Batsch.) *var. ovoideum)* [12]

03 - **Physarum citrinum** Schumach.
Syll. 7: 340, n. 1176
GOLA, sub *P. citrinum* Schwein.
a) Hortus Botanicus Patavinus, 1879 (Bizzozzero) [7]
GOLA, sub *Physarum schumacheri* Spreng.
b) N.A.F., n. 1395 ; **c)** F.A.E., n. 477

04 - **Physarum compressum** Alb.& Schwein.
Syll. 7: 337, n. 1167
a) M.I., n. 1519 (1904) ; **b)** H.C.C.O. (1901) ; **c)** Padova, 1877 [5] ; **d)** Padua, Orto Botanico (legit Pigal, 1903) ; **e)** Hortus Botanicus Patavinus, 1912 (Nalesso) ; **f)** Hortus Botanicus Patavinus, 1880 ; **g)** S. 1880 ("*f.sessile*") ; **h)** (Francia?)

05 - **Physarum conglomeratum** (Fr.) Rostaf.
Syll., 7: 342, n.1184
GOLA, sub *Physarum ochraceum* Hoffm. [Not *Diderma ochraceum* Hoffm.!!]
a) Fungi Schemnitzenses (1887)

06 - **Physarum contextum** (Pers.) Pers.
Syll. 7: 342, n. 1185
GOLA, sub *P. contextum* Pers.
a) N.A.F, n. 2086 (1885) ; **b)** F.B.E.,. n. 525 (as *Diderma contextum*) ; **c)** P.S., n. 106.

07 - **Physarum didermoides** (Pers.) Rostaf.
Syll. 7: 338, n. 1171 (as *P. didermoides* (Arch.) Rostaf.)
a) M.I., n. 929 (1903) ; **b)** Selva, n.142, 1874 [2]
GOLA, sub *Physarum atrum* Salm. (mispelled for Schwein.?)
c) Herb. J. R. Weir, n. 971 (1917)

08 - **Physarum flavicomum** Berk.
Syll. 7: 345, n. 1193
GOLA, sub *Physarum berkeleyi* Rostaf.
a) N.A.F., n. 3299 (1894)
GOLA, sub *Physarum cupriceps* Berk.et Rav.
b) F.C.E., n. 76 [**SYNTYPE**, fide Stevenson (1971) diagnosis in Berk. Grev., 2: 65, 1873 as *P. cupripes* Br. & Br.]

09 - **Physarum flavidum** (Peck) Peck
Syll. 7: 350, n. 1215
GOLA, sub *Physarum citrinellum* Peck
a) N.A.F., n. 2490

10 - **Physarum galbeum** Wingate.
Syll. 22: 794, n. 6001
a) N.A.F., n. 2491 (1889) (**SYNTYPE**, fide Stevenson, 1971,diagnosis in McBride North. Amer. Slime-Moulds: 53, 1899]

11 - **Physarum globuliferum** (Bull.) Pers.
Syll. 7: 339, n.1172 (as *P. globuliferum* (Bull.) Rostaf.)
a) P.S., n. 104 ; **b)** Pixton O., A. P. M.

12 - **Physarum gyrosum** Rost.
Syll. 7: 346, n.1197 (as *Physarum muscorum* (Alb. & Schw.) Berl.)
a) N.A.F.,n. 1396

13 - **Physarum leucophaeum** Fr.
Syll. 7: 345, n. 1192
a) N.A.F., n. 614 ; **b)** N.A.F., n. 2693 ; **c)** N.A.F., n. 2694 ; **d)** F.B.E., n. 519 ; **e)** P.S., n. 99 ; **f)** Pampanini, Lago di Revine (1903) ; **g)** Magnaguti, Sermide, 1868 **h)** ; Hortus Botanicus Patavinus, 1893 **i)** ; S., 1875 ; **j)** S., 1878 ; **k)** Selva, 1874, n 36 [2] ; **l)** Selva, 1889 ; **m)** ?, 1894 ; **n)** Alger? n.13 ; **o)** ?? n.35
Missing : **p)** Herb. Cavara

14 - **Physarum leucopus** Link
Syll. 7: 343, n. 1188
GOLA, sub *P. leucopus* (Link) Rostaf.
a) Fairman, Fungi of New Orleans County (1904)

15 - **Physarum mutabile** (Rostaf.) G.Lister
Lister. Mycetozoa: 53, 1911
GOLA, sub *P. mutabilis* Rostaf.
a) N.A.F., n. 1213 (as *Tilmadoche mutabilis* Rostaf.) ; **b)** P.S., n. 86 (as *Tilmadoche mutabilis* Rostaf. v. *aurantiaca*)
GOLA, sub *Crateriachea mutabilis* (Syll. 7: 358, n.1243)
c) F.E., n. 2675 (as *Didymium neapolitanum* Ces., legit Cesati) **[SYNTYPE,** diagnosis on label]

16 - **Physarum nucleatum** Rex
Syll. 7: 339, n. 1175 (as *P.simile* Rostf.)
GOLA, sub *Physarum simile* Rostaf.
a) Pixton O., A. P. M.

17 - **Physarum nutans** Pers.
Syll. 7: 359, n.1144 (as *Tilmadoche nutans* (Pers.) Rostaf.)
GOLA, sub *P. nutans* Rostaf.
a) F.A.E., n.478 (as *Physarum leucophaeum*, corrected to *P. nutans*) ; **b)** Vicetiae, n.5 [1] ; **c)** Therry ? ; **d)** S. 1875 ; **e)** S. 1880 ; **f)** Montello, 1872, n.21 [1]
All the following as *Tilmadoche nutans* (Pers.) Rostaf.
g) F.L.E., n. 2 ; h) M.U., n. 1498 (1878) ; **i)** Magnaguti, Sermide, 1876 ; **j)** S., 1876 **k)** Gallia, n.28 ?? ; **l)** Sacc.???

18 - **Physarum pezizoideum** (Jungh.) Pav.& Lag.
Syll. 7: 364, n. 1256 (as *Chondrioderma pezizoideum* (Jungh.) Rostaf.)
GOLA, as *Chondrioderma pezizoides* (Jungh.) Rostaf.
a) Gracemere, Australia [22]

19 - **Physarum polycephalum** Schwein.
Syll. 7: 352, n. 1223
GOLA, as *Physarum gyrocephalum* Mont.
a) Prixton O., A. P. M. (as *Tilmadoche gyrocephala* (Mont.) Rost. (Syll.7: 361, n. 1248))
GOLA, as *Physarum polymorphum* (Mont.) Rostaf.
b) N.A.F., n. 2699 (as *Tilmadoche gyrocephala* Mont.) = *Physarum multiplex* Pk.) **c**) Ellis, n.3552 (as *Didymium polymorphum* Mont.) [14] ; **d**) Ellis, n.3554 (as *Physarum polymorphum* Rostaf.)

20 - **Physarum psittacinum** Ditmar
Syll. 7: 341, n. 1179
a) N.A.F.,. n. 2492 ; **b**) Malebranche, Eure, France, n.176 [12]
Missing : **a**) M.G., n.?

21 - **Physarum pulcherrimum** Berk.& Rav.
Syll. 7: 341, n. 1178
GOLA, sub *P. pulcherrimum* B. et C.
a) N.A.F., n. 2897 ; **b**) F.C.E., n. 77 [**SYNTYPE**, fide Stevenson (1971) diagnosis in Berk. Grev., 2: 65, 1873]

22 - **Physarum pulcherripes** Peck
Syll. 7: 349, n. 1207
GOLA, sub *Physarum pulchripes* Peck
a) Pixton O., A. P. M.
GOLA, sub *Physarum petersii* Berk. et Curt.
b) N.A.F., n. 1120 (as *P.petersii* Berk. & Curt., var. *farlowii* Rostaf.) ; **c**) N.A.F., n. 3300

23 - **Physarum pusillum** (Berk. & M. A. Curt.) G.Lister
Syll. 10: 83, n. 4796 (as *Badhamia nodulosa* Massee)
a) Ghinda, 73, Eritrea (1916) [38]
GOLA, as *Physarum nodulosum* Cke. et Balf.
b) F.A.E., n. 479 [**SYNTYPE**, *nomen nudum,* fide Stevenson, 1971]

24 - **Physarum rubiginosum** Fr.
Syll. 7: 341, n. 1180
a) Bresadola (1899)

25 - **Physarum stellatum** (Massee) Martin
Syll. 7: 361, n. 1249 (as *Tilmadoche columbina* (Berk.) Rostaf.)
a) N.A.F., n.2087 (as *T. columbina* (Berk.)) ; **b**) Prixton O., A. T. M. (as *T. columbina* Berk.)
GOLA, as *Physarum compactum* Wingate.
c) N.A.F., n.3499 (1889) (as *Tilmadoche compacta* Wingate) ; **d**) E. Ule, Appendix Mycotheca Brasiliensis, n. 1 (1901) (as *P. compactum* Lister)

26 - **Physarum sulphureum** Alb. & Schwein.
Syll. 7: 343, n. 1187
a) P.S., n. 101

27 - **Physarum tenerum** Rex
Syll. 10: 84, n. 4800
a) N.A.F., n.2489 [**SYNTYPE,** fide Stevenson (1971) diagnosis in Proc. Acad. Nat. Sci. Phil., 1890: 192, 1890]

28 -**Physarum virescens** Ditmar
Syll. 7: 341, n. 1183
a) P.S., n. 96 ; **b)** Vittorio, n.38, 1873 [2]
GOLA, sub *Physarum ditmari* Rostaf.
c) N.A.F., n. 2692

29 - **Physarum viride** (Bull.) Pers.
Syll. 7: 360, n. 1247 (as *Tilmadoche viridis* (Gmel.) Sacc.)
a) E. Ule, Herbarium Brasiliense, n. 2665 (1901) ; **b)** Herb. W. G. Farlow, South Carolina (as *Tilmadoche variabilis* Rostaf.) ; **c)** T. Furnig (?), 1901 (as *P. viride var. luteum* (Bull.) Rost.) ; **d)** Sacc., Montello, 1880 (as *Tilmadoche viridis* (Gmel.) Sacc.) [8]

30 - **Undetermined**
a) *Physarum* ?, S., 1875 ; **b)** *Physareae*, S., 1875 ; **c)** *Physarum* " indeterminabile", Selva, 1872

12 - **Wilkommlangea** Kuntze

01 - **Wilkommlangea reticulata** (Alb. & Schwein.) Kuntze
Syll. 7: 329, n. 1140 (as *Cienkowskia reticulata* (Alb. & Schwein.) Rostaf.
GOLA, sub *Cienkowskia reticulata* (Alb. & Schwein.) Rostaf.
a) Prixton O., A.F.M.

16 - ***Stemonitales*** Macbr.
01 - **Brefeldia** Rostaf.

01 - **Brefeldia maxima** (Fr.) Rostaf.
Syll. 7: 402, n. 1377
a) F.B.E., n. 518 ; **b)** "environs de Mantoue", Magnaguti (1875) ; **c)** Cansiglio, 1874 (as *Reticularia maxima* Fr.) ; **d)** Cansiglio, 1874, on *Fagus* [2] ; **e)** on *Pinus excelsa*

02 - **Comatricha** Preuss

01 - **Comatricha laxa** Rostaf.
Syll. 7: 396, n. 1358
GOLA, sub *Comatricha ellisiana* (Cooke)

a) N.A.F., n. 2696 ; **b**) N.A.F., n. 3495 (as *C. ellisii* Morgan)

02 - **Comatricha nigra** (Pers.) Schröt.
Syll. 7: 395, n.1356 (as *Comatricha friesiana* (de By.) Rostaf.
a) P.S., n. 58
GOLA, sub *Comatricha friesiana* (D.B.) Rostaf.
b) F.E.P.S., n.99 (1889) ; **c**) Prixton O., A.P.M. ;: **d**) Möller, Coimbra, Dec.1891 [28] ; **e**) Libert, 383 [13] [15] ; **f**) Therry, n.1527 [13] ; **g**) Hortus Botanicus Patavinus, n.16, 1873 ; **h**) Hortus Botanicus Patavinus, 1889
GOLA, sub *Comatricha obtusata* Preuss
i) Montello, 1876 (as *Comatricha physaroides* (A. S.) Sacc.) [4]
sub *Stemonitis obtusata* Fr.
j) Ravenel, Fungi Caroliniani Exsiccati, n. 84

03 - **Comatricha pulchella** (C.Bab.) Rost.
Syll. 7: 395, n. 1357
GOLA, sub *C. pulchella* Bab.
a) N.A,F., n. 3599
GOLA, as *Comatricha gracilis* Wingate
b) N.A.F., n.2094 [**SYNTYPE,** *nomen nudum,* fide Stevenson, 1971].
GOLA, sub *Comatricha persoonii* Rostaf.
c) Selva, 1873 [2] ; **d**) Selva, 1874 [2]

04 - **Comatricha typhoides** (Bull.) Rostaf.
Syll. 7: 394, n. 1355 (as *Comatricha typhina* (Roth) Rostaf.)
GOLA, sub *Comatricha typhina* Rostaf.
a) N.A.F., n. 1117 ; **b**) Letendre, n.931 [11] ; **c**) Brunard, n.1718 [10] ; **d**) Cansiglio, 1874 [2] ; **e**) Cansiglio, 1876 ; **f**) Cansiglio, 1878 ; **g**) n.16 (??)
sub *Stemonitis typhoides* (Bull.) D.C.
h) F.C.E., n. 76

03 - **Enerthenema** Bowman

01 - **Enerthenema papillatum** (Pers.) Rostaf.
Syll. 7: 402, n. 1378
a) Sibiria (Minussinsk, Martianoff) [9] ; **b**) Brunard, n.106 [11]

04 - **Lamproderma** Rostaf.

01 - **Lamproderma arcyrioides** (Sommerf.) Rostaf.
Syll. 7, 393, n. 1353
GOLA,.sub *L. arcyrioides* (Sommf.)
a) N.A.F., n. 2698 ; **b**) F.B.E., n. 523 ; **c**) C.L., n. 5202 [12] ; **d**) Roumeguère, n.137 (1829) [12] ; **e**) Roumeguère, n.138 (*junior*) (1829) [12]
GOLA, sub *Lamproderma nigrescens* Sacc.
f) Herb. Möller (Coimbra) (1892) [28] ; **g**) Saccardo, 1880 [**HOLOTYPE**, latin diagnosis in Michelia, 2: 263, 1881] [8]
GOLA, sub *Lamproderma violaceum* (Fr.) Rostaf.

h) N.A.F., n. 3199 (1893)

02 - **Lamproderma arcyrionema** Rostaf.
Syll. 7: 393, n. 1352
GOLA, sub *L. arcyrionema* Karst.
a) N.A.F., n. 2898

03 - **Lamproderma carestiae** (Ces. & De Not.) Meylan
Syll. 7, 392, n. 1349 (as *Lamproderma violaceum* (Fr.) Rostaf.).
GOLA, sub *L. violaceum* (Fr.) Rostaf.
a) Herb. Ab. A. Carestia, n. 4 (1888) (as *L. violaceum* Rost. f. *carestiae* = *L. arcyrioides* (Sommerf.) Rostaf.) ; **b)** Herb. Ab. A. Carestia, n.144 (1889) (as *L.violaceum* Rostaf. f. *carestiae* = *Stemonitis carestiae* Ces. & De Not.) [30] [**ISOTYPE**, the Holotype being the specimen of the Herb.Ab. A.Carestia, n.144 deposited at RO]

04 - **Lamproderma columbinum** (Pers.) Rostaf.
Syll. 7: 391, n. 1345
GOLA, sub *L. columbinum* Rostaf.
a) F.E., n. 2213 ; **b)** Libert 386 (as *L. columbinum * melanocephalum*) [13] [15]
GOLA, sub *Lamproderma physaroides* (Alb. & Schwein.) Rostaf.
c) Roumeguère 264 [12]

05 - **Lamproderma scintillans** (Berk. & Br.) Morgan
Syll. 7: 394, n. 1353 (as *Lamproderma arcyrioides var. irideum* Cooke).
GOLA, sub *Lamproderma irideum* Massee
a) N.A.F., n. 3600 ; **b)** M.I., n. 1520 (1904).

05 - **Stemonitis** Roth

01 - **Stemonitis axifera** (Bull.) Macbr.
Syll. 7: 398, n. 1365 (as *Stemonitis ferruginea* Ehrenb..)
GOLA, sub *Stemonitis ferruginea* Ehrenb.
a) F.C.E., n. 75 ; **b)** F.A.E., n. 788 ; **c)** M.U., Reliquiae Libertianae, n. 1897 ; **d)** P.S., n. 56 ; **e)** Herb. Ab. A. Carestia, n. 26 (1857) [30, as *S. fusca*] ; **f)** Herb. Ab. A. Carestia, n. 1136 (1891) [30] ; **g)** Dain Tree River, Nord America (U.S.A.), 1886 ; **h)** Padova, 1879 ; **i)** Crescentino (Vercelli), Ferraris, 1889

02 - **Stemonitis fusca** Roth
Syll. 7: 397, n. 1362
GOLA, sub *S. fusca* Rh.
a) N.A.F., n. 1119 ; **b)** F.B.E., n. 522 ; **c)** P.S., n. 54 ; **d)** F.G.E., n. 143 [.1] ; **e)** F.G.E., n.1314 (as *S. fusca* Roth f. *minor*) ; **f)** F.E., n. 374 ; **g)** Herb. Ab. A. Carestia, n. 1847 (1899) ; **h)** P. A. Saccardo, Herbarium Tarvisinum (1863) ; **i)** Trotter, Congo Belga (1907) ; **j)** Berlin (1876) ; **l)** Sibiria (Minussinsk, Martianoff) [9] ; **k)** Wostoznoje (Sibiria), n. 2060 (1875) ; **m)** Taurini, DNTRS (De Notaris) ; **n)** Calabria (1907) ; **o)** Magnaguti, 1866 ; **p)** Magnaguti, 1877 ;

q) Rouen (?), n. 1796 ; **r**) Libert 968 [15] ; **s**) Selva, 1874 ; **t**) Selva, n.40 ; **u**) Selva ? ; **v**) S(acc.) , n.75 ; **w**) Cansiglio [1] ; **x**) n.72 ; **y**) V.1875 ; **z**) Zanel Vittorio, Padua ; **aa**) France??

GOLA, as *Stemonitis maxima* Schwein.

ab) N.A.F., n.2697 (corrected as "= *fusca*")

03 - **Stemonitis herbatica** Peck

Syll. 7: 398, n. 1367

a) Alf. Dewevre n.5, Congo, 1895 [32] ; **b**) Padova, 1900, on *Chamaerops*

04 - **Stemonitis pallida** Wingate

Syll. 22: 803, n. 6030

a) N.A.F., n.3498 [**SYNTYPE**, fide Stevenson (1971), diagnosis in Macbr. North Amer. Slime-Moulds: 123, 1899]

05 - **Stemonitis smithii** Macbr.

Syll. 11: 466, n. 2928

GOLA, sub *S. smithii* Macdl. (mispelled for Macbr.)

a) Herb. Ab. A. Carestia, n. 1305 (1868) [30] ; **b**) P. A. Saccardo, Cansiglio (1897)

06 - **Stemonitis splendens** Rostaf.

Syll. 7: 398, n. 1364

a) M.I., n. 343 (1898) ; **b**) F.L.E., n.3 (as *Stemonitis fusca* Roth, corrected to *S. splendens*) ; **c**) F.L.E., n. 252 ; **d**) H.C.C.O. (as *Stemonitis dictyospora v. splendens*) ; **e**) Herb. Ab. A. Carestia, n. 229 (1860) [30] ; **f**) Herb. Ab. A. Carestia, n. 1135 (1891) (as *Stemonitis fusca* Roth, corrected to *S. splendens*) [30] ; **g**) *S. splendens* f. *genuina*, Selva (1875) ; **h**) Mount Savour, Redditi, n.102, Eritrea [38] ; **i**) Montello (1871) ; **j**) Ferraris, Crescentino (Vercelli) 1900) ; **k**) Selva, 1875 ; **l**) Selva, 1876 (as *S. splendens* f. *confluens*)

GOLA, sub *Stemonitis morgani* Peck (Syll. 7:399, n.1368)

m) N.A.F., n. 2088 (corrected as *S. splendens* Rostaf.)

07 - **Stemonitis virginiensis** Rex

Syll. 22: 804, n. 6034

a) N.F., n.2896 [**SYNTYPE**, fide Stevenson (1971); diagnosis in Proc. Acad. Nat. Sci. Phil., 1891: 391, 1891]

III - **Plasmodiophoromycetes**

17 - *Plasmodiophorales*

01 - **Plasmodiophora** Woronin

01 - **Plasmodiophora brassicae** Wor.

Syll.: 8: 464, n. 1568

a) F.P., n. 126 (1889 -1890) ; **b**) F.P.S.E., n.293 (1887) ; **c**) F.H., n. 500 (1885); **d**) M.G., n. 22 (1900) ; **e**) P.S., n. 117

02 - **Plasmodiophora vitis** Viala & Sauvageau
Syll. 16: 824
a) F.P., n. 226 (1892)
Missing: **b)** Herb. Cavara (as *Pseudocommis vitis* De Bary)

02 - **Sorosphaera** Schröt.

01 - **Sorosphaera veronicae** Schröt.
Syll. 7: 466, n. 1574
a) M.I., n. 1451 (1904) (as "*Ustilaginaceae"*) ; **b)** P.S., n. 128 ; **c)** G.Lagerheim, (*V. hederifolia*)(1900) ; **d)** G. Lagerheim (*V.chamaedrys*) (1900); **e)** Sydow, Ustilaginaceen, n. 350 (legit G. Lagerheim) (1900); **f)** Hortus Botanicus Patavinus, 1904, Antonietta Saccardo Vanzetti e Traverso (*Ustilaginacea*)

References

[1] Saccardo P.A.,Mycologiae venetae specimen. Atti Soc.Ven.-Trent. Sc. Nat., Padova, 2: 58-264, 1873
[2] Saccardo P.A.,Fungi veneti novi vel critici, s.IV,Atti Soc.Ven.-Trent. Sc.Nat., Padova, 4: 101-141, 1875
[3] Saccardo P.A.,Fungi veneti novi vel critici, s.V, N.Giorn.Bot.Ital., 8: 161-211, 1876
[4] Saccardo P.A.,Fungi veneti novi vel critici, s.VI,Michelia, 1: 1-72, 1877
[5] Saccardo P.A.,Fungi veneti novi vel critici, s.IX,Michelia, 1: 361-445, 1878
[6] Saccardo P.A.,Fungi veneti novi vel critici, s.X, Michelia, 1: 539-546, 1878
[7] Saccardo P.A.,Fungi veneti novi vel critici, s.XI,Michelia, 2: 154-176, 1880
[8] Saccardo P.A.,Fungi veneti novi vel critici,s.XII,Michelia, 2: 241-301, 1881
[9] Saccardo P.A.,Fungorum extra-europaeorum pugillus.Michelia, 2: 136-153, 1882
[10] Saccardo P.A.,Fungi gallici.....in Mycotheca Gallica cl.C. Roumeguèri.,s.I, Michelia, 1: 500-538, 1879
[11] Saccardo P.A.,Fungi Gallici....in Mycotheca Gallica cl.C. Roumeguèri.,s.II, Michelia, 2: 39-135, 1882
[12] Saccardo P.A.,Fungi Gallici....in Mycotheca Gallica.cl.C.Roumeguèri.,s.III, Michelia, 2: 302-371, 1882
[13] Saccardo P.A.,Fungi gallici.....in Mycotheca Gallica cl.C.Roumeguèri.,s.IV, Michelia, 2: 583-648, 1882
[14] Saccardo P.A.,Fungi boreali-americani, Michelia, 2: 564-648, 1882
[15] Roumeguère C. & P.A. Saccardo, Reliquiae mycologicae Libertianae, s.II, Revue Mycologique, 3: 39-59, 1881
[16] Saccardo P.A. & C. Roumeguère, Reliquiae mycologicae Libertianae, s.IV, Revue Mycologique, 6: 26-39, 1884
[17] Marchal E., Champignons coprophiles de la Belgique, Gand, 1885, 42 pp.
[18] Saccardo P.A. & A.N.Berlese, Miscellanea mycologica, s.II, Atti Ist.Ven., t.III, s.VI, 40: 711-742, 1885
[19] Saccardo P.A. & G.Paoletti, Mycetes malacenses, Atti R.Ist. Ven., t.VI, s.VI, 45: 387-428, 1887
[20] Saccardo P.A., Funghi delle Ardenne nelle Cryptogamae Arduennae..., Malpighia, 1: 211, 1887
[21] Berlese A.N., Fungi veneti novi vel critici, Malpighia, 1: 581, 1887
[22] Berlese A.N., Excursion mycologique dans le Frioul, Bull. Soc. Mycologique de France, 5: 36, 1889

[23] Berlese A.N., Saccardo P.A. & C.Roumeguère, Contributiones ad floram mycologicam Lusitaniae. s.II, Revue Mycologique, 11: 117-124, 1889
[24] Saccardo P.A., Fungi aliquot australienses a cl.O.Tepper lecti et a cl. prof. F.Ludwig communicati, s.III., Hedwigia, 29: 154-156, 1890
[25] Bresadola J.& P.A.Saccardo, Pugillus mycetum australiensium, Malpighia, 4: 289-301, 1890
[26] Saccardo P.A.,Fungi abyssinici cl. O.Penzig collecti. Malpighia, 5:274-283, 1891
[27] Saccardo P.A., Micetes aliquot australienses,s.IV. Hedwigia, 32: 56-59, 1893
[28] Saccardo P.A., Florula mycologica Lusitanica sistens contributionem decimam ad eadem floram. Bol.Soc.Brot.,11: 9-70, 1893
[29] Saccardo D., Contributo alla flora micologica di Schemnitz. Atti Soc.Ven.-Trent. Sc. Nat., s.II, 3: 167-202, 1896
[30] Bresadola G. & P.A.Saccardo, Enumerazione dei funghi della Valsesia raccolti dal Ch. Ab. Antonio Carestia.Series I , Malpighia, 11: 241-325, 1897
[31]Bresadola G. & P.A.Saccardo. Enumerazione dei funghi della Valsesia raccolti dal Ch. Ab. Antonio Carestia.Series II, Malpighia, 13: 425-452, 1889
[32] Breasadola J. & P.A.Saccardo, Fungi congoenses. Bull.Soc.R. Bot.de Belgique, 38: 152-168, 1899
[33] Traverso G.B., Micromiceti della Provincia di Modena. Malpighia, 17: 65-72 ,1903
[34] Saccardo P.A.& F.Cavara, Funghi di Vallombrosa, N.Giorn.Bot.Ital., n.s.,7: 272-310, 1900
[35] Saccardo P.A.,Notae mycologicae, s.IV, Species novae vel notabiliores. Annales Mycologici, 2: 12-17, 1904
[36] Saccardo P.A., Notae mycologicae. s.XX (II), Fungi Philippinenses.N.Giorn.Bot.Ital., 23:185-234,1916
[37] Saccardo P.A., Notae mycologicae, s.XXI. Pugillo di funghi della Val di Aosta. N. Giorn. Bot.Ital., 24: 31-43, 1917
[38] Saccardo P.A., Notae mycologicae, s.XXII (VI), Fungi Erithraei. Atti e Mem. R. Acad. Sci. Lett. ed Arti, Padova, 23: 157-195,1917
[39] Saccardo P.A., Notae mycologicae,s,XXV, Fungi veronenses. Madonna Verona, pag. 23-24, 1918

[40] Saccardo P.A. & A.Trotter, I funghi dell'Avellinese.Avellino 198 pp., 1920.

Bibliography

Bergey's Manual of Determinative Bacteriology. Baltimore, Williams & Wilkins. 6th Edition, 1948, 1529 pp.; 7th Edition, 1957, 1094 pp.; 8th Edition, 1974, 1268 pp.
Bergey's Manual of Systematic Bacteriology, Baltimore, Williams & Wilkins, voll. I-IV, 1984-1989, 2648 pp.
Brummit R.K. & C.E. Powell, Edts., Authors of Plant Names. Kew, The Royal Botanic Garden, 1992, 732 pp.
Gola G., L' Erbario Micologico di P.A. Saccardo. Padova, Tipografia Editrice Antoniana, 1930, 328 pp.
Greuter & al., Edts., International Code for Botanical Nomenclature (Tokyo Code). Koenigstein (Germany), Koeltz Scientific Books, 1994, 389 pp.
Karling J.S., The Plasmodiophorales. New York, Hafner Publish.Co., 1968, 256 pp.
Lister A., A Monograph of the Mycetozoa (3rd Edition revised by G. Lister), London, Johnson Reprint Corporation, 1925, 296 pp.
Martin G.W. & C.J. Alexopoulos, The Myxomycetes. Iowa City, Univeristy of Iowa Press, 1969, 561 pp.
Martin G.W., C.J. Alexopoulos & M.L. Farr, The Genera of Myxomycetes. Iowa City, University of Iowa Press, 1983, 103 pp.

Saccardo P.A., Sylloge Fungorum Omnium Hucusque Cognitorum. Padova, Tipografia del Seminario: IV: Hyphomycetes, 1886, 807 pp.; VII: Myxomycetes (A.N. Berlese), 1888, 882 pp.; VIII: Saccharomycetes (De Toni & Trevisan), 1889, 1143 pp.; IX: Supplementum Universale I, 1891, 1144 pp.; X: Supplementum Universale II, 1892, 964 pp.; XI:Supplementum Universale III, 1895, 753 pp.; XVI: Supplementum Universale IX (P.A. Saccardo & A. Trotter, 1913, 1612 pp.

Stevenson J.A., An account of Fungus Exsiccati containing material from the America, Beihefte z. Nova Hedvigia, 36: 1-563, 1971.

Index to Scientific Names

Names in capital letter refer to Genera, in roman to accepted Species, and in italics to the synonyms or doubtful or undetermined species.

ACETOBACTER Beij., 0901
aceti (Pasteur) Beij., 090101
ACTINOMYCES Harz, 0101
bovis Harz, 010101
Aecidium strobilinum, 140505
Aethaliopsis stercoriformis Zopf, 150601
Aethalium....., 150603
septicum, 150602
vaporarium Fr, 150602
Amaurochaete minor Sacc. & Ell., 150801
Angioridium sinuosum (Bull.) Grev., 151101
Arcyria....., 140109
ARCYRIA Wiggers, 1401
albida Pers., 140101
cinerea Bull., 140101
cinerea (Bull.) Pers., 140101
cinerea (Bull.) Schum. v. *cylindrica*, 140101
denudata (L.) Wettst., 140102
globosa Schwein., 140103
incarnata (Pers.) Pers., 140104
incurvata Pest., 140104
nutans (Bull.) Grev., 140105
- - f. *flava*, 140105
pomiformis (Leers) Rostaf., 140106
pomiformis (Roth) Rostaf., 140106
punicea Pers., 140101; 140201
reticulata, 140202
stipata (Schwein.) A.Lister, 140107
versicolor Phillips., 140108
vitellina Phillips, 140108
Bacillus....., 020103
BACILLUS Cohn, 0201
acidi lactici (Zopf) Schröt., 050201
anthracis Cohn, 020101
cubonianus Macch., 080103
leguminosarum (Frank.), 090201
marcescens (Bizio) Trevis., 050501
mori Voglino, 080103
oleae Arcang., 080102
radicicola, 090201
radicicola Beij., 090201
subtilis (Ehrenb.) Cohn, 020102
tubercolosis Koch., 060101
Bacteridium prodigiosum, 050501
BACTERIUM Ehrenb., 0401
aceti Thüm., 090101
aceti (Kuetz.) Lanzi, 090101
acidi lactici Zopf, 050201
aurantiacum (Cohn) Trel.,050101
candidum (Cohn) Trel., 050103
incarnatum Trel., 050104
luteum Trel., 050105
termo (Müller) Ehrenb., 040101
Badhamia....., 150109
BADHAMIA Berk., 1501
apiculispora (Härk) U.Eliass. & Lundq. 150101
capsulifera (Bull.) Berk., 150102; 150508
hyalina (Pers.) Berk., 150102
inacervata Can., 150105
inaurata Curr., 150105
lilacina Fr., 150103
lilacina (Fr.) Rostaf., 150103
macrocarpa (Ces.) Rostaf., 150104
nitens Berk., 150105
nodulosa Massee, 151123
obovata (Peck) S.J.Smith, 150106
ovispora Racib., 150101
panicea (Fr.) Rostaf., 150107
punicea Rostaf., 150107
rubiginosa (Chev.) Cooke, 150106

rubiginosa (Chev.) Rostaf., 150106
utricularis (Bull.) Berk., 150108
Beggiotoa roseo-persicina Zopf, 050401; 080201
BREFELDIA Rostaf., 1601
maxima (Fr.) Rostaf., 160101
Carcerina spumarioides Fr., 150404
CERATIOMYXA Schröt., 1101
arbuscula, 110101
fruticolosa (Müll.) Macbr., 110101
mucida (Pers.) Schröt. v. *rubicunda*, 110101
Ceratium arbuscula B. & Br., 110101
hydnoides (Jacq.) Alb. & Schwein., 110101
mucidum (Schröt.) Pers., 110101
Chondrioderma cookey Rostaf.,150508
difforme (Pers.) Rostaf., 150502
floriforme Bull., 150401
globosum Rostaf., 150402
lyallii Massee, 151101
michelii (Lib.) Rostaf., 150403
niveum Rostaf., 151101
pezizoides (Jungh.) Rostaf., 151118
pezizoideum (Jungh.) Rostaf.,151118
spumarioides (Fr.) Rostaf., 150404
testaceum Schrad., 150405
trevelyani (Grev.) Rostaf., 150406
Cienkowskia reticulata (Alb.& Schwein.) Kuntze, 150201
Cladothrix dichotoma Cohn, 070301
CLASTODERMA A.Blytt, 1302
debaryanum A.Blytt, 130201
Clathrocystis roseo-persicina Cohn, 080201
Clathroptychium cinnabarinum Sacc., 120201
plumbeum, 120702
rugulosum Rostaf., 120201
CLOSTRIDIUM Prazmowsky, 0301
butyricum Prazmowsky, 030101
butyricum (Pasteur) Prazmowsky, 030101
COMATRICHA Preuss, 1602
ellisiana (Cooke), 160201
ellisii Morgan, 160201
friesiana (de By.) Rostaf., 160202
gracilis Wingate, 160203
laxa Rostaf., 160201
nigra (Pers.) Schröt., 160202
obtusata Preuss, 160202
persoonii Rostaf., 160203
physaroides (A.S.) Sacc., 160202
pulchella C.Bab., 160203
pulchella (C. Bab.) Rostaf., 160203
typhina (Roth) Rostaf., 160204
typhina Rostaf., 160204 080201
typhoides (Bull.) Rostaf., 160204
Cornuvia....., 140503
Cornuvia wrightii B.C., 140501
wrightii (Berk. & Curtis) Rostaf., 140501
Cosmariospora....., 140109
Crateriachea mirabilis, 151115
Craterium....., 150203
CRATERIUM Trent., 1502
leucocephalum Pers., 150201
leucocephalum (Pers.) Ditmar, 150201
minutum Fr., 150202
minutum (Leers) Fr., 150202
pedunculatum Trent., 150202
turbinatum, 150201
CRENOTHRIX Cohn, 0701
khueniana Rabhenh., 070101
khueniana (Rabenh.) Giard, 070101
polyspora Cohn, 070101
CRIBRARIA Pers., 1201
argillacea (Pers.) Pers., 120101
aurantiaca Schrad., 120102
dictydioides Cooke & Balf., 120103
dictyoidea Cooke & Balf., 120103
intricata Schrad., 120103
macrocarpa Schrad., 120104
tenella Schrad., 120105
Detoniella ochracea (Trevis.) Rotten., 070201
DIACHEA Fr., 1503
elegans Fr., 150301
leucopodia (Bull.) Rostaf., 150301
Dictyaethalium plumbeum Rostaf., 120201
DICTYDIAETHALIUM Rostaf., 1202
plumbeum (Schum.) Rostaf., 120201; 120702
DICTYDIUM Schrad., 1203
cancellatum (Batsch) Macbr., 120301
cernuum (Pers.) Nees, 120301
umbilicatum Schrad., 120301
Dictyopus mucuroides Marchal & Sacc., 100101
DICTYOSTELIUM Bref., 1001
mucoroides Marchal & Sacc., 100101
sphaerocephalum (Oudem.) Sacc. & March., 100101
DIDERMA Pers., 1504
candidum Schrad., 150402

contextum, 151106
floriforme (Bull.) Pers., 150401
globosum Pers., 150402
-- pr.p. f. pannosa, 150402
hemisphaericum (Bull.) Hornem., 150403
lyallii (Massee) Macbr., 151101
niveum (Rostaf.) Macbr., 151101
ochraceum Hoffm., 151105
spumarioides (Fr.) Fr., 150404
testaceum (Schrad.) Pers., 150405
trevelyani (Grev.) Fr., 150406
vernicosum, 150701
DIDYMIUM Schrad., 1505
capsulifer B., 150508
cinereum Batsch , 131102
-- v. *ovoideum*, 151102
cinereum Fr., 151102
cinereum Morg., 151102
clavus A. & S., 150501
clavus (Alb. & Schwein.) Rabenh., 150501
complanatum Rostaf., 150507
costatum Fr., 150508
difforme (Pers.) S.F. Gray, 150502
effusum Link, 150508
eximium Peck., 150504
fairmani Sacc., 150505
farinaceum Schrad., 150505
fuckelianum Rostaf., 150508
iridis (Ditmar) Fr., 150503
lisimachiae-nummulariae, 150509
macrocarpum Rostaf., 150103
megalosporum Berk. & M.A. Curtis., 150504
melanospermum (Pers.) Macbr., 150505
microcarpon (Fr.) Chev., 150506
-- v. *nigripes*, 150506
microcarpum (Fr.) Rostaf., 150506
microcarpum Rostaf., 150506
neapolitanum Ces., 151115
nigripes Fr., 150506
-- f. *genuinum*, 150506
-- f. *eximium*, 150504
-- f. *xanthopus* 150503
nigripes (Link) Fr., 150506
physaroides Alb.& Schwein.,150508
polymorphum Mart., 151119
proximum B. & C., 150503
serpula Fr., 150507
spumarioides Fr., 150901
squamulosum Fr., 150508
squamulosum (Alb.& Schwein.) Fr., 150508
-- v. *leucopus*, 150508
-- v. *sessile*, 150508
subcastaneum Romel, 150406
xanthopus Fr., 150503
Diphtarium....., 150603
ENERTHENEMA Bowmann, 1603
papillatum (Pers.) Rostaf., 160301
Enteridium olivaceum Ehrenb., 120702
rozeanum (Rostaf.) G.Winter.,120703
FRANKIA Brunch., 0102
alni (Woronin) Tubeuf, 010201
subtilis Brunch., 010201
Frankiella alni (Woronin) Maire & Tison, 010201
Fuligo....., 150603
FULIGO Hall, 1506
cinerea (Schwein) Morgan, 150601
septica (L.) F.H. Wigg., 150602
septica (L.) Haller f. *vaporaria* (Bull.) Fr., 150602
stercoriformis Zopf, 150601
varians Sommf., 150602
Halococcus litoralis Shoop., 050401
morrhuae (Farlow) Kokur, 050401
morrhuae (Klebhan) Kokur & Hodgkiss 050401
Hemiarcyria circumscissa (Wall.) Rut., 140503
clavata (Pers.) Rost., 140201
rubiformis Pers., 140301
serpula Scop., 140202
stipata Schw., 140107
Hemitrichia indeterminabile, 140203
HEMITRICHIA Rostaf., 1402
clavata (Pers.) Rostaf., 140201
contorta, 140602
serpula (Scop.) Rostaf., 140602
Isaria arbuscula Bres., 110101
Lachnobolus globosus (Schwein.) Rost., 140103
-- v. *minor*, 140103
incarnatus (Alb. & Schwein.) Schröt., 140104
LAMPROCYSTIS Schröt., 0802
roseo-persicina (Kuetzing) Schröt. 080201
LAMPRODERMA Rost., 1604
arcyrioides (Sommerf.), 160401
arcyrioides (Sommerf.) Rostaf., 160401; 150403
-- v. *irideum* Cooke, 150405

arcyrionema Karst., 160402
arcyrionema Rostaf., 160402
carestiae (Ces.& De Not.) Meylan, 160403
columbinum Rostaf., 160404
columbinum (Pers.) Rostaf., 160404
-- **melanocephalum*,160404
irideum Massee, 160405
nigrescens Sacc., 160401
physaroides (Alb.& Schwein.)Rostaf., 160404
scintillans(Berk.& Br.)Morgan,160405
violaceum (Fr.) Rostaf., 160401
violaceum Rostaf.f. *carestiae*,160403
Lampropedia littoralis (Oerst.) De Toni & Trevis., 050401
LEOCARPUS Link, 1507
fragilis (Dicks.) Rostaf., 150701
vernicosum Pers., 150701
LEPIDODERMA de Bary, 1508
granuliferum (Phillips) R.E.Fries,150801
tigrinum (Schrad.) Rostaf., 150802
LEPTOTHRIX Kuetzing, 0702
ochracea Kuetzing, 070201
LEUCONOSTOC Thiegh., 0503
mesenteroides (Tsentkovskii) Thiegh., 050301
LICEA Schrad., 1204
artocreas Berk. & Ravenel, 140502
circumscissa Pers. f.*pannosa,* 140502
cylindrica Fr., 120802
fragiformis Fr., 120802
guaranitica Speg., 120402
olivacea Fuckel, 120702
operculata (Wingate) Martin, 120401
spermoides Berk. & Curtis., 120501
strobilina Alb. & Schwein., 140505
LINDBLADIA Fr., 1206
effusa (Ehrenb.) Rostaf., 120501
tubulina Fr., 120501
LYCOGALA Adans., 1206
epidendrum (Fr.) Burb., 120601
epidendrum (L.) Fries, 120601
epidendrum Buxb., 120601
flavofuscum (Erhenb.) Rostaf.,120602
miniatum, 120601
minutum Sacc. & Paol., 120603
terrestre Fr., 120601
METATRICHIA Ing., 1403
vesparium (Batsch) Nann-Bremek., 140301
MICROCOCCUS (Schröt.) Cohn, 0501
aurantiacus Cohn, 050101
bombycis (Naegeli) Cohn, 050202
bombycis Cohn, 050202
candidus Cohn, 050203
-- f. *ovi gallinacei*, 050203
incarnatus, 050204
luteus (Schröt.) Cohn, 050205
ovatus (Lib.) Winter, 050202
prodigiosus (Ehrenb.), 050501
prodigiosus Cohn, 050501
Monas prodigiosa, 050501
Monosporium acuminatum, 110101
MUCILAGO Micheli ex Batt., 1309
crustacea Wiggers, 130901
MYCOBACTERIUM Lehm. & Neumann 0601
tubercolosis (Zopf) Lehm. & Neumann, 060101
Mycoderma aceti, 090101
aceti Pasteur, 090101
Myxosporium croceum Sacc., 120201
Nocardia actinomyces Trevis., 010101
Nosema bombycis Naegeli, 050102
OLIGONEMA Rostaf., 1404
bavaricum (Thüm.) Balf. & Berl., 140401
nitens (Lib.) Rostaf., 140401
nitens Rostaf., 140401
nitens Thüm., 140401
schweinitzii (Berk.) Martin, 140401
Ophiotheca umbrina Berk. & Curt., 140504
Orcadella operculata Wingate, 120401
Orthotrichia microcephala Wingate, 130101
Palmella prodigiosa, 050501
PEDIOCOCCUS Balcke, 0503
acidilactici Lindner, 050301
aurantiacus De Toni & Trevis.,050101
PERICHAENA Fr., 1405
artocreas Berk. & Ravenel., 140502
chrysosperma (Currey) A.Lister,140501
corticalis Batsch, 140502
corticalis (Batsch) Rostaf., 140502
depressa Lib., 140503
fusco-atra (Sibth.) Rostaf., 140502
populina Fr., 140502
strobilina Fr., 140505
variabilis Rostaf., 140504
vermicularis (Schwein.) Rostaf.,140504
Physareae....., 151130
PHYSARELLA Peck, 1510
mirabilis Peck, 151001
oblonga (Berk.& Curtis) Morgan,

151001
Physarum....., 151130
PHYSARUM Pers., 1511
atrum Salm., 151107
berkeley Rostaf., 151108
bivalve Pers., 151101
cinereum Pers., 150404
cinereum (Batsch) Pers., 151102
- - v. *herbicola*, 151102
citrinellum Peck, 151109
citrinum Schumach., 151103
citrinum Schwein., 151103
compactum Lister, 151125
compactum Wingate, 131125
compressum Alb. & Schwein., 151104
conglomeratum (Fr.) Rostaf., 151105
contextum Pers., 130107; 151106
contextum (Pers.) Pers., 151106
cupriceps Berk. & Ravenel, 151108
cupripes Br. & Br., 151108
didermoides (Arch.) Rostaf., 150505; 151107
didermoides (Pers.) Rostaf., 151107
ditmari Rostaf., 151128
farinaceum Pers., 150505
flavicomum Berk., 151108
flavidum (Peck) Peck, 151109
galbeum Wingate, 151110
globuliferum (Bull.) Pers., 151111
globuliferum (Bull.) Rostaf., 151111
gyrocephalum Mont., 151119
gyrosum Rostaf., 151112
hyalinum Pers. f. *pannosum*, 151102
leucophaeum Fr., 151113; 151117
leucopus Link, 151114
leucopus (Link) Rostaf., 151114
multiplex Pk., 151119
muscorum (Alb. & Schwein.) Berl., 151112
mutabile (Rostaf.) G.Lister, 151115
mutabilis Rostaf., 151115
nodulosum Cke. & Balf., 151123
nucleatum Rex, 151116
nutans Pers., 151117
nutans Rostaf., 151117
ochraceum Hoffm., 151105
petersii Berk. & Curtis, 151122
- - v. *farlowii* Rostaf., 151122
pezizoideum (Jungh.) Pav. & Lag., 151118
polycephalum Schwein., 151119
polymorphum (Mont.) Rostaf., 151119
polymorphum Rostaf., 151119
psittacinum Ditmar, 151120
pulcherrimum B. & C., 151121
pulcherrimum Berk. & Ravenel, 151121
pulcherripes Peck, 151122
pulchripes Peck, 151122
pusillum (Berk. & M.A. Curtis) G.Lister, 151123
rubiginosum Fr., 151124
schumacheri Spreng., 151103
scorpioides Cke. & Balf., 150301
scyphoides Cooke & Balf., 150301
simile Rostaf., 151116
sinuosum (Bull.) Rostaf., 151101
sinuosum (Weinm.) Fr., 151101
stellatum (Massee) Martin, 151125
subulatum Schum., 150301
sulphureum Alb. & Schwein., 151126
tenerum Rex, 151127
tussilaginis Br. & Br., 150508
virescens Ditmar, 151128
viride (Bull.) Pers., 151129
- - v. *luteum* (Bull.) Rostaf., 151129
Phytomyxa leguminosarum Frank, 090201
leguminosarum (Frank) Schröt., 090201
PLASMODIOPHORA Woronin, 1701
alni (Woronin) Möller, 010201
brassicae Woronin, 170101
vitis Viala & Sauvageau, 170102
Pleosporopsis strobilina, 140505
Protococcus roseus Kuetz., 080101
Pseudocommis vitis de Bary, 170102
PSEUDOMONAS Migula, 0801
citricola Smith, 080101
savastanoi (Erw.Smith) Stevens, 080102
syringae pv. mori (Boy. & Lamb.) Young, 080103
RETICULARIA Bull., 1207
lycoperdon Bull., 120701
maxima Fr., 160101
olivacea (Ehrenb.) Fr., 120702
rozeana Rostaf., 120703
splendens Morgan, 120703
umbrina Fr., 120701
venosa B. & C., 120704
venulosa Berk. & Curtis, 120704
RHIZOBIUM Frank, 0902
leguminosarum, 090201
leguminosarum (Frank) Frank, 090201
SARCINA Farl., 0504

  litoralis Paulsen, 050401
  littoralis Paulsen, 050401
  morrhuae Kokur, 050401
  morrhuae Farl., 050401
Schinzia alni Woronin, 010201
  lupini Thüm. f. *L. lutei*, 090201
SERRATIA Bizio, 0505
  marcescens Bizio, 050501
SOROSPHAERA Schröt., 1702
  veronicae Schröt., 170201
SPHAEROTILUS Kuetzing, 0703
  natans Kuetzing, 070301
SPIRILLUM Ehrenb., 0903
  eichleri Sacc., 090301
Spumaria alba, 150404
  alba (Bull.) D.C., 150901
  - - v. *sardou*, 150901
  mucilago Pers., 150901
Stegasma australe Ces., 140503
STEMONITIS Roth, 1605
  axifera (Bull.) Macbr., 160501
  carestiae Ces. & De Not., 160403
  dictyospora v. *splendens*, 160506
  ferruginea Ehrenb., 160501
  fusca Rh., 160502
  fusca Roth, 160501; 160502; 160506
  - - f. *minor*, 160502
  herbatica Peck, 160503
  maxima Schwein., 160502
  morgani Peck, 160506
  obtusata Fr., 160202
  pallida Wingate, 160504
  smithii Macbr., 160505
  smithii Macdl., 160505
  splendens Rostaf., 160506
  - - f. *confluens*, 160506
  - - f. *genuina*, 160506
  typhoides (Bull.) D.C., 160304
  virginiensis Rex, 160507
Syphoptychium caspary Rostaf., 120801
Tilmadoche columbina Berk., 151125
  columbina (Berk.) Rostaf., 151125
  compacta Wingate, 151125
  gyrocephala (Mont.) Rostaf.,151119
  mutabilis Rostaf., 151115
  - - v. *aurantiaca*, 151115
  nutans (Pers.) Rost., 151117
  oblonga (B. & C.) Rostaf., 151001
  variabilis Rostaf., 151129
  viridis (J.F. Gmel.) Sacc., 151129
Torula (Mycoderma) aceti, 090101
Torula aceti Sacc., 090101
Trichia ....., 140610
TRICHIA Haller, 1406
  affinis De Bary., 140602
  bavarica Thüm., 140401
  botrytis Pers., 140607
  botrytis (J.F. Gmel.) Pers., 140601
  - - v. *subfusca* (Rex) A.Lister, 140607
  chrysosperma Bull., 140605
  chrysosperma (Bull.) D.C., 140605
  chrysosperma D.C., 140605
  *chrysosperma * turbinata*, 140605
  circumscissa (Wallr.) Rostaf., 140503
  clavata, 140201
  contorta (Ditmar) Rostaf., 140602
  decipiens (Pers.) Macbr., 140603
  erecta Rex, 140604
  fallax Pers., 140603
  favoginea (?) tipica, 140605
  favoginea (Batsch) Pers., 140605
  ferruginea, 140605
  floriformis (Schwein.) G.Lister,140606
  fragilis (Sow.) Rostaf.,140601;140606
  - - f. *botrytis*, 140606
  - - f. *simplex*, 140601
  inconspicua Rostaf., 140401
  jakii Rostaf., 140605
  kalbreyeri Massee, 140605
  nigripes Pers., 140201; 140609
  nitens Lib., 140401
  nitens Pers., 140605
  persimilis Karst., 140605
  - - v. *nigripes* Rost., 140609
  proximella Karst., 140605
  pyriformis Hoffm., 140301
  scabra Rostaf., 140607
  serpula (Scop.) Pers, 140202
  - - b. *reticulata*, 140202
  subfusca Rex, 140608
  varia (Pers.) Pers. 140609
Trichosporium curtisii Massee, 120704
TUBIFERA J.F.Gmel., 1208
  casparyi (Rostaf.) Macbr., 120801
  ferruginosa (Batsch) J.F. Gmel., 120802
Tubulina cylindrica Bull., 120501; 120802
  fragiformis Pers., 120501; 120802
  guaranitica Roum., 120402
  guaranitica Speg., 120402
  spermoides (Berk.& M.A. Curtis) Massee, 120501
WILKOMMLANGEA Kuntze, 1512
  reticulata (Alb.& Schwein.) Kuntze,151201

MYCOTAXON

Volume LXIV, pp. 141-147 September 1997

Gymnopus villosipes – a common collybioid agaric from California

DENNIS E. DESJARDIN[1], ROY E. HALLING[2]
and BRIAN A. PERRY[1]

[1] *Department of Biology, San Francisco State University, 1600 Holloway Ave., San Francisco, CA 94132*
[2] *Institute of Systematic Botany,The New York Botanical Garden, Bronx, NY 10458*

Abstract: *Marasmius villosipes*, first described from material collected under Monterey pines in Australia, represents a common collybioid agaric native to California. The species is redescribed and illustrated, and a formal transfer to *Gymnopus* is proposed.

Keywords: Agaricales, *Collybia*, *Gymnopus*, *Marasmius*, taxonomy

Gymnopus villosipes is a commonly encountered agaric found throughout coastal California from Monterey County northward. A name for this agaric had eluded us for many years and we initially presumed that the taxon was undescribed. Recent type studies of Australian *Marasmius* by Desjardin (unpubl.) revealed that our common California species was described by Cleland (1934) as *Marasmius villosipes* Cleland from material collected under *Pinus radiata* D. Don (Monterey Pine) in Australia. We contend that the species was introduced to Australia along with Monterey Pine and that it actually represents a native California taxon.

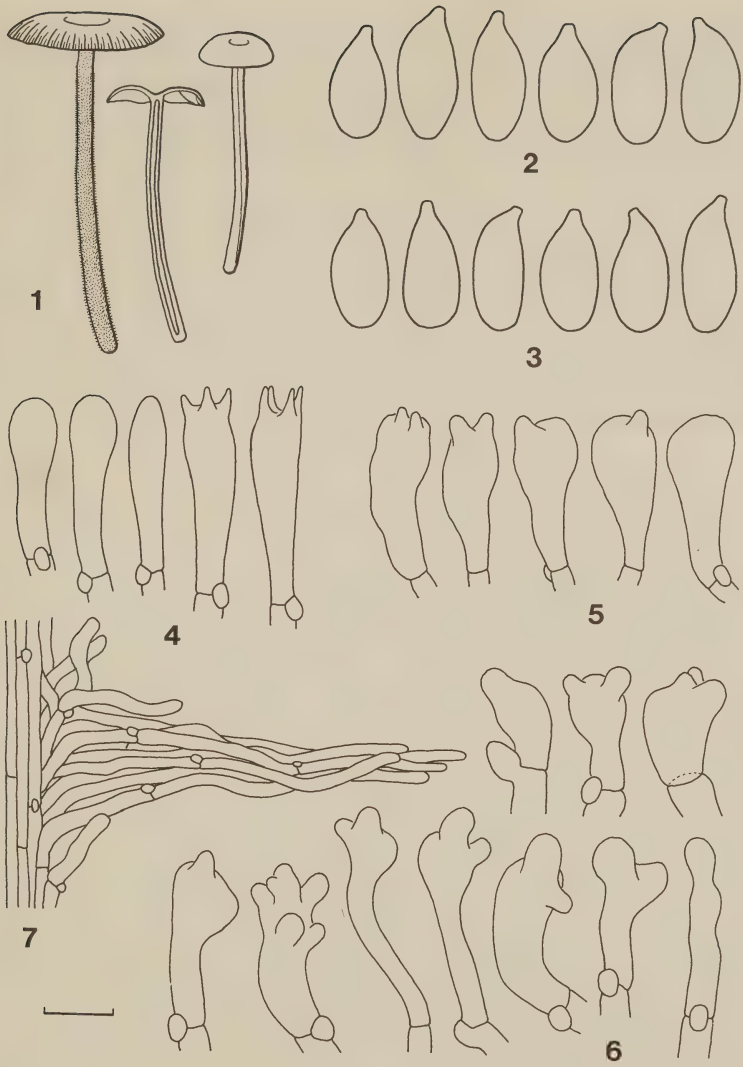
In a recent re-evaluation of the genus *Collybia* (Antonín et al., 1997), the taxon was accepted as representing three distinct genera: *Collybia sensu stricto*, limited to *C. tuberosa* (Bull.: Fr.) Kummer and allies [≡ *Microcollybia* sensu Lennox (1979)]; *Rhodocollybia* Singer, for species belonging to *Collybia* subgenus *Rhodocollybia* (Sing.) Halling (see Halling, 1983); and the bulk of *Collybia sensu lato* belonging to *Gymnopus* (Pers.) Roussel. A brief description and black and white photograph of *Gymnopus villosipes* (as *Collybia fuscopurpurea* group) can be found in the popular field guide "Mushrooms Demystified" (Arora, 1986: 214). We present here a more comprehensive description based on analyses of the holotype specimen and numerous California specimens, and make the formal transfer to *Gymnopus*. In the description that follows, color terms and notations are from Kornerup and Wanscher (1978); spore statistics include: $\bar{x}_r$, the range of spore means where $\bar{x}$ is the arithmetic mean of the spore length by spore width for n spores measured in a single sample (specimen); $\bar{x}_m$, the mean of spore means (± SD); Q, the quotient of spore length and spore width in any one spore, indicated as a range of variation in n spores measured; $\bar{Q}_r$, the range of $\bar{Q}$-values where $\bar{Q}$ is the mean of Q-values in a single sample; $\bar{Q}_m$, the mean of $\bar{Q}$-values. All specimens are deposited in SFSU unless specified otherwise. Frequently cited collectors are abbreviated as follows: D. E. Desjardin (DED), Harry D. Thiers (HDT).

Gymnopus villosipes (Cleland) Desjardin, Halling and Perry *comb. nov.*

≡ *Marasmius villosipes* Cleland, Trans. Royal Soc. S. Australia 58: 213. 1934. Type: AD.

Description based on California specimens:

Basidiomes (Fig 1) marcescent to putrescent. **Pileus** 10-25 (-40) mm diam, convex to broadly convex when young, expanding with age to plano-convex or plane, usually shallowly depressed or umbilicate; margin incurved and smooth at first, becoming decurved or rarely uplifted in age and sometimes splitting, pellucid-striate to rugulo-striate up to one third way to the disc at maturity; surface dull, moist to dry, hygrophanous, glabrous; at first dark brown overall (7-8F4-8), fading in age or with moisture loss to reddish brown (8E5-6), brown (6-7E4-8), or light brown (6-7D5-60, then finally pale brownish grey (6-7C3-4) or greyish orange (5B4). **Context** thin (1-2 mm), soft, buff or watery-concolorous with lamellae. **Lamellae** adnate to adnexed, close to subdistant (14-20) with 2-3 series of lamellulae,



Figs. 1-7. *Gymnopus villosipes*. 1. Basidiomes. x1 (DED 3175). 2-3. Basidiospores. 4. Basidia and basidioles. 5-6. Cheilocystidia. 7. Fasiculate stipitipellis hyphae. Scale bar = 5 µm for Figs. 2-3; 10 µm for Figs. 4-6; 20 µm for Fig. 7. [Figs. 2, 5 = AD 10786 (Holotype). Figs. 3-4, 6-7 = DED 1950]

moderately broad (2-3 mm), straight to convex, occasionally intervenose and anastomosed, with even to slightly fimbriate edges; light brown (6-7D4), greyish brown (6D3), brownish grey (6-7C3) or greyish orange (5-5B3-4) with paler (buff to nearly white) edges, often darkening overall in age. **Stipe** 30-60(-80) X (1.0-)1.5-4.0 mm, central to slightly eccentric, terete or compressed and once-cleft, ±equal, sometimes curved and with a subbulbous base, tough, dull, dry, stuffed to hollow, velutinous to pubescent above, base villose to strigose; vestiture buff to tawny or brownish orange (5C4-5); apex pallid, becoming progressively darker towards the base and with age from light brown (5-6D5-6) to brown (5-7E4-8); non-insititious, arising from a mat of fine white mycelium that holds the litter together. **Odor** not distinctive; **taste** mild or slightly unpleasant.

Basidiospores (Fig. 2-3) 6.5-10.5 X 3.5-4.5 µm [$\bar{x}_r$ = 7.4-9.3 X 3.7-4.2 µm, $\bar{x}_m$ = 8.4 ± 0.7 X 4.0 ± 0.2 µm, Q = 1.5-2.9, $\bar{Q}_r$ = 1.8-2.4, $\bar{Q}_m$ = 2.1± 0.2, n = 25 spores per 15 specimens], ellipsoid to subamygdaliform, inequilateral in profile, smooth, thin-walled, hyaline, inamyloid, acyanophilic, white or rarely dark cream in deposit. **Basidia** (Fig. 4) 25-34 X (5.0-) 6.5-7.5 µm, clavate, 4-spored. **Basidioles** (Fig. 4) clavate to subfusoid. **Pleurocystidia** absent. **Cheilocystidia** (Fig. 5-6) abundant, 12-35(-43) X (3.8-)4.5-9.5(-11.0), irregularly cylindrical to contorted-clavate, sometimes sinuous, hyaline, thin-walled, with 1-6 broad, knob-like to irregular apical or subapical outgrowths. **Pileipellis** a cutis; hyphae 3.5-8.0(-12.0) diam, repent, radially arranged, slightly interwoven, with a few scattered, knob-like to cylindrical diverticula, typically incrusted with zebroid to annular brown pigments; walls thin, non-gelatinous, hyaline to pale brown, inamyloid; terminal cells repent to suberect, cylindrical to subclavate, hyaline, typically smooth and non-incrusted. **Pileus trama** interwoven; hyphae 3.0-8.0(-9.5) µm diam, cylindrical, branched, non-gelatinous, non-incrusted to weakly incrusted, hyaline to pale brown, inamyloid. **Hymenophoral trama** regular; hyphae as in pileus trama. **Stipe tissue** monomitic; cortical hyphae 3-8 µm diam, parallel, cylindrical, non-gelatinous, inamyloid, hyaline and thin-walled at stipe apex, golden brown and thick-walled (-1.0 µm) at stipe base. **Stipitipellis** (Fig. 7) a loosely interwoven trichodermium with fascicles of erect hyphae that form the villosity on stipe surface; hyphae 2.5-4.5 µm diam, grouped in fascicles of 10-100, cylindrical to sinuous or tortuous, obtuse, non-incrusted, thin-walled, hyaline to pale yellow, inamyloid; bundles of hyphae projecting up to 600 µm beyond stipe surface. **Clamp connections** abundant in all tissues; no tissues staining blue or green in 3% KOH.

Habit, habitat and distribution. Scattered to densely gregarious, often subcespitose, in sandy soil, leaf litter or grassy areas under conifers, often on leaves of *Pinus radiata*, *P. muricata* D. Don, *P. contorta* Loudon, *Pseudotsuga menziesii* (Mirbel) Franco, *Sequoia sempervirens* (D. Don) Endl., or *Tsuga heterophylla* (Raf.) Sarg. Most common between November and February in California; basidiomes developing throughout the year in horticultural areas. Australia, California.

Material Examined. AUSTRALIA: Lowan Forest, Kalangadoo (S 37°34', E 140°42') and Caroline Forest, Mount Gambier (S 37°55', E 140°51'), May 1928, J. B. Cleland no. 10005 (Holotype: AD no. 10786!). UNITED STATES: California. Contra Costa Co.: Berkeley, University of California, 6 Apr. 1942, E. E. Morse (NY). Humboldt Co.: Patrick's Point State Park, 15 Sept. 1968, HDT 22922; same location, 27 Nov. 1991, Halling 6732 (NY). Marin Co.: Muir Woods Nat. Monument, 24 Nov. 1966, Dem 583; Ross, Phoenix Lake, 3 Dec. 1960, HDT 8524; Audubon Canyon Ranch, Volunteer Canyon, 13 Nov. 1979, Calhoun 79-1003; Inverness Ridge, 10 Oct. 1981, DED 451 (NY, SFSU); same location, 5 Dec. 1984, Halling 3948 (NY); Inverness, Limantour Ridge, 2 Sept. 1981, DED 462; same location, 26 Nov. 1983, DED 2604; San Geronimo Valley, 22 Oct. 1981, DED 932; Audubon Canyon Ranch, Bolinas Ridge Rd., 4 Oct. 1981, Calhoun 81-2358; same location, 11 Oct, 1981, Calhoun 81-2417; same location, 21 Nov. 1981, Calhoun 81-2711; Samuel P. Taylor State Park, Lagunitas, 24 Nov. 1984, DED 3199. Mendocino Co.: Jackson State Forest (J.S.F.), 26 Nov. 1976, HDT 37037; same location, 26 Nov. 1977, HDT 38428; Jasper, 24 Nov. 1979, HDT 40475; J.S.F., Hwy 408, ca 2 mi. east of Mendocino, 13 Nov. 1982, DED 1738; same location, 19 Nov. 1983, DED 2576; J.S.F., near Mendocino, 1 Nov. 1985, HDT 49242; same location, 19 Oct. 1986, HDT 50645; Dunlop Campground, Hwy 20, ca 20 mi east of Ft. Bragg, 26 Nov. 1982, DED 1852; same location, 23 Nov. 1992, Halling 6973 (NY); J.S.F., jct. Hwy 408 & 409, 25 Nov. 1982, DED 1862; same location, 12 Nov. 1983, DED 2556; same location, 19 Nov. 1983, DED 2577; same location, 17 Nov. 1984, DED 3175; Hwy 409, 21 Nov. 1982, DED 1865; J.S.F., along Hwy 408, near Mendocino, 12 Nov.

1983, DED 2524; same location, 22 Dec. 1983, DED 2730; same location, 20 Oct. 1989, Davis 0151 (NY); Wayside Campground, 26 Oct. 1984, Seidl 143; Bean's Orchard, 25 Oct. 1986, Seidl 302 (NY). Monterey Co.: Monterey, city park along Munras St., 23 Jan. 1986, Halling 4628 (NY). San Francisco Co.: Lake Merced Golf Course, 24 Dec. 1966, HDT 24552; same location, 17 Jan. 1970, HDT 24729; San Francisco State University Campus, 13 Nov. 1964, HDT 11770; same location, 19 April 1965, HDT 12414; same location, 26 Dec. 1970, HDT 27008; same location, 18 Oct. 1972, HDT 30182; same location, 17 Nov. 1980, Bigelow 18524 (NY); same location, 24 June 1982, DED 1438; same location, 30 June 1982, DED 1467 (NY, SFSU); same location, 23 July 1982, HDT 44670; same location, 24 Aug. 1982, HDT 44713; same location, 14 Feb. 1983, DED 1950; same location, 25 Feb. 1983, DED 1982; same location, 2 Aug. 1983, HDT 46000; same location, 26 July 1984, DED 2948; same location, 11 Dec. 1984, Halling 4016, 4017 (both NY); same location, 7 June 1985, Halling 4482, 4483 (both NY); same location, 7 Sept. 1989, Davis 0011 (NY); same location, 21 Aug. 1990, DED 4977; same location, 4 Aug. 1991, HDT 53561, 53562, 53563, 53564; Golden Gate Park, 9 Jan. 1982, Saylor 1367. San Mateo Co.: San Francisco Watershed, 8 Dec. 1966, HDT 17955; San Mateo Co. Park, 19 Feb. 1983, DED 1968; Sam McDonald Co. Park, 11 Dec. 1983, DED 2717. Sonoma Co.: Salt Point State Park, 25 Nov. 1972, HDT 30763; same location, 1 Mar. 1986, HDT 49435.

Commentary. *Gymnopus villosipes* is characterized by a dark brown to brownish grey, hygrophanous pileus, pale-concolorous lamellae, a pallid to brown stipe covered with buff to tawny vestiture, nodulose-contorted cheilocystidia, thin-walled, fasiculate stipitipellis hyphae, and sporulation in dense clusters under conifers. The species is allied with *Gymnopus biformis* (Pk.) Halling (≡ *Collybia biformis* (Pk.) Singer in sect. *Subfumosae*). The latter species differs from *G. villosipes* in forming closer and narrower lamellae that are typically white to pale cinereous (never brown), has slightly smaller basidiospores ($\bar{x}_r$ = 7.1-7.6 X 3.4-3.6 µm), and stipitipellis hyphae that are thicker walled (0.5-1.2 µm). The basidiomes of *G. villosipes* are often locally abundant and can survive *in situ* for an extended period. Because of prolonged exposure to the weather, a great deal of variability in the macroscopic characters of the stipe can be observed. In wet weather the stipe will appear dark purplish brown and glabrous when in fact the vestiture has been matted down. As the basidiomes dry out, the vestiture appears buff to tawny colored over a brown ground color. Also the quantity and orientation of the vestiture may vary and is especially apparent when dried material is compared. It may be quite pallid and repent overall in one extreme, and tawny to cinnamon brown in erect fascicles at the other. Another interesting variation is in basidiospore deposit color. Although most specimens tested dropped a white spore print, two specimens (DED 1968 & DED 2604) showed a dark cream colored spore print.

The type collection (AD!) is represented by several intact basidiomes apparently collected at two locations in Australia in May 1928. Data with the collection indicate that the species was collected at Lowan Forest, Kalangadoo and Caroline Forest, Mount Gambier, although it is impossible to determine which basidiomes came from which site. All basidiomes are conspecific and match details provided in the protologue.

LITERATURE CITED

Antonín, V., R. E. Halling, and M. Noordeloos. 1997. Generic concepts within the groups of *Marasmius* and *Collybia sensu lato*. Mycotaxon: in press.

Arora, D. 1986. Mushrooms Demystified. Ten Speed Press, Berkeley, CA. 959 p.

Cleland, J. B. 1934. Australian fungi: notes and descriptions.– No. 10. Trans. Royal Soc. S. Australia 58: 211-213.

Halling, R. E. 1983. The genus *Collybia* (Agaricales) in the northeastern United States and adjacent Canada. Mycol. Memoirs 8: 1-148.

Kornerup, A., and J. H. Wanscher. 1978. *Methuen handbook of colour.* 3rd. ed. Eyre Methuen, London. 252 p.

Lennox, J. W. 1979. Collybioid genera in the Pacific Northwest. Mycotaxon 9: 117-231.

MYCOTAXON

Volume LXIV, pp. 149-171 September 1997

NOTES ON SOME 'DIMERIACEOUS' FUNGI

MARGARET E. BARR

9475 Inverness Road, Sidney, British Columbia V8L 5G8
Canada

SUMMARY

The family Pseudoperisporiaceae is reviewed and the genera accepted are briefly discussed. The new species *Raciborskiomyces garryanus* is proposed. New combinations in *Eudimeriolum*, *E. andromedae* and *E. plantaginis*, in *Nematostoma*, *N garryae* and *N. parasiticum*, in *Neocoleroa*, *N. alpivaga*, *N. dryadis*, *N. fimbriata*, *N. gallica*, *N. lichenicola* subsp. *lichenicola* and subsp. *bouteillei*, and *N. molarifera*, in *Phaeodimeriella*, *P. langloisii* and *P. meliolicola*, and in *Raciborskiomyces*, *R. longisetosus*, *R. peltigericola*, and *R. volkartianus* are presented.

The so-called 'dimeriaceous' fungi are minute to small (ascomata 40-100 or up to 250 µm diam), superficial biotrophs or hyperbiotrophs that develop on a scanty or abundant mycelium. Their hamathecium is composed of rather sparse pseudoparaphyses; asci are oblong, occasionally inflated in the lower part, and contain eight hyaline or light brown ascospores. Some develop subcuticular hyphae, haustoria, and/or intercellular hyphae. Others are entirely superficial, chiefly surrounding trichomes, and only rarely penetrate leaf tissues after senescence of the substrate. The hyperbiotrophs develop superfically over mycelium of meliolalean or asterinalean hosts. Numerous genera have been described, most often based upon variation in vestiture of ascomata and pigmentation of the uni- or several-septate ascospores.

Three family names have been proposed. The first chronologically, Epipolaeaceae Theiss. & P. Syd. (Ann. Mycol. 16: 7. 1918) is invalid [Arts. 32.1(c), 34.1(b), Hawksworth and David (1989)]. The second name, Pseudoperisporiaceae Toro *in* Seaver & Chardon (Sci. Surv. Puerto Rico 8: 40. 1926) was validly described, but has been little utilized until recently (Hawksworth et al. 1995). The type genus and species, *Pseudoperisporium erigeronicola* (F.L. Stev.) Toro, is a synonym of *Lasiostemma melioloides* (Berk. & M.A. Curtis) Theiss. & Syd. (Farr 1979). The third name, Dimeriaceae E. Müll. & Arx [Beitr. Kryptogamenfl. Schweiz 11(2): 473. 1962 ex Arx & E. Müll., Stud. Mycol. (Baarn) 9: 104. 1975] has been used quite extensively, not only by Müller and Arx (1962) but by Farr (1979, 1984), Barr (1987b), Eriksson and Hawksworth (1993).

Hawksworth and Eriksson (1988) proposed to conserve the name Dimeriaceae with the type genus *Dimerium* (Sacc. & P. Syd.) Sacc. & P. Syd., having as lectotype species *D. pulveraceum* (Speg.) Theiss. & Syd. (Theissen and Sydow 1918) against the Pseudoperisporiaceae. This proposal was not recommended (Gams 1992). Gams cited problems in the typification of *Dimerium*, and indicated that the name was correctly cited as *Dimerium* (Sacc. & P. Syd.) McAlpine (1903). Both Gams (1992) and Hughes (1993) pointed out that the proposed lectotype species of *Dimerium* had not been chosen from one of the original species.

Dimerium was first recognized as a subgenus of *Dimerosporium* by Saccardo & P. Sydow, (Syll. Fung. 16: 410. 1902), with four species: *D. pangerangense* Henn. & Nyman, *D. ctenotrichum* Pat. & Hariot, *D. tasmanicum* Massee, and *D. occultum* Racib. The first two of these are asterinalean leaf parasites; *D. pangerangense* is identical to *Asterina crustacea* Cooke, now *Echidnodella crustacea* (Cooke) Arx in the Asterinaceae, while *D. ctenotrichum* is the type species of *Chevalieropsis* Arnaud in the Parodiopsidaceae (Müller and Arx 1962, Hawksworth et al. 1995). When McAlpine (1903) raised *Dimerium* to generic rank, he included of the original species only *Dimerium tasmanicum* in an informal transfer of the Australian species of *Dimerium*, while leaving *Dimerosporium parvulum*, the earlier name for *D. occultum* (Hansford 1946) in that genus. *Dimerium tasmanicum* must be the lectotype species of *Dimerium*. Hansford (1954) provided a detailed description of the species from the type specimen and transferred it to *Maireella* Syd. *in* Maire. If the species is congeneric with the type species of *Maireella*, *Dimerium* would provide the earlier generic name for species assigned to *Maireella* and its synonym *Winteromyces* Speg. Comparative studies are needed to resolve this question. *Maireella* differs substantially from the species of *Gibbera* Fr., where Müller and Arx (1962) had synonymized it. The species of *Maireella* were discussed and illustrated by Jenkins et al. (1941). They form both multiloculate and uniloculate stromata in which the clavate asci are quite peripherally arranged. The genus fits well as a member of the Coccoideaceae rather than the Venturiaceae. Spegazzini (1908) transferred *Dimerosporium occultum* to *Phaeodimeriella* when he erected that genus, although he did not designate a type species. Theissen (1912) lectotypified *Phaeodimeriella* by *P. occulta*, as did Theissen and Sydow (1918), and the name has been utilized by Müller and Arx (1962). Hansford (1946) recognized that *P. parvula* was the earlier name for the taxon.

Furthermore, Hughes (1993) recognized that *Dimerium* was validated prior to Saccardo and D. Saccardo (Syll. Fung. 16: 410. 1905) by Sydow & P. Sydow (Ann. Mycol. 2: 169. 1904) when they described the monotypic *Dimerium olivaceum* Syd. & P.Syd. This fungus is a biotroph that forms a subcuticular hyphal layer from which superficial hyphae, conidia, and ascomata develop; Hughes (1993) redescribed and illustrated it. *Dimerium olivaceum* differs from *Perisporiopsis* Henn. (Parodiopsidaceae) in lacking stomatopodia and internal haustoria and in forming a subcuticular layer, as well as by the anamorph of brown, septate conidia formed holoblastically on superficial hyphae. The wide brown ascospores and aparaphysate asci of this species are characteristic of members of the Asterinales, although more precise disposition is still required.

The family Pseudoperisporiaceae is rich in generic names and synonyms. In an effort to clarify understanding of the taxa, an annotated list of these names, their type species, and their known disposition is presented below. An asterisk denotes disposition of the genus elsewhere than in the Pseudoperisporiaceae. Those genera that are here accepted in the family are listed in **boldface.**

**Acanthophiobolus* Berl. 1892 - *A. helminthosporus* (Rehm) Berl. = *A. helicosporus* (Berk. & Broome) J. Walker. Dimeriaceae (Barr 1987b); inc. sed. (Hawksworth et al. 1995); Tubeufiaceae (Barr, new disposition)

**Acanthostigma* De Not. 1863 - *A. perpusillum* De Not. = ? *Nematostoma* (Arx and Müller 1975, Eriksson and Hawksworth 1993; Hawksworth et al. 1995); unitunicate fungus (Müller 1965); accepted genus in Trichosphaeriaceae (Barr 1990)

**Acanthostigmella* Höhn. 1905 - *A. genuflexa* Höhn. = *Tubeufia* (Arx and Müller 1975); accepted genus in Herpotrichiellaceae (Barr 1977, 1991); ? Tubeufiaceae (Untereiner et al. 1995, Hawksworth et al. 1995)

Acanthostoma Theiss. 1912 - *A. wattii* (Syd. & Butler) Theiss. = *Phaeodimeriella* (Petrak 1950, Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Acarothallium Syd. 1937 - *A. hansfordii* Syd. = *Dimeriella* (Hansford 1946); = *Wentiomyces* (Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995) = probably *Eudimeriolum* or *Eumela* (Farr 1984)

**Antennulariella* Woron. 1915 - *A. fuliginosa* Woron. = *Wentiomyces* (Müller and Arx 1962, Arx and Müller 1975); accepted genus in Antennulariellaceae (Hughes 1976, Barr 1987b, Hawksworth et al. 1995)

Aphanostigme Syd. 1926 - *A. solani* Syd. Accepted (Hansford 1946, Müller 1965, Arx and Müller 1975, ? Eriksson and Hawksworth 1993, Hawksworth et al. 1995); probably = *Nematostoma* (Petrak 1949, Rossman 1987)

Asteromyxa Theiss. & Syd. 1917 - *A. hirtula* (Speg.) Theiss. & Syd. = *Wentiomyces* (Müller and Arx 1962, Arx and Müller 1975); = *Dimeriella* (Parodiopsidaceae) (Hawksworth et al. 1995); in Antennulariellaceae (Barr 1987b)

Astiothyrium Bat. *in* Bat. et al. 1964 - *A. hymenaeae* Bat. & Bezerra = *Eudimeriolum* (Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Bolosphaera Syd. & P. Syd 1917 - *B. degenerans* Syd. & P. Syd. = *Phaeostigme* (Hawksworth et al. 1995); = *Dimerium* (Hansford 1946, Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993); i.e., probably *Phaeodimeriella*

Bryochiton Döbbeler & Poelt 1978 - *B. monascus* Döbbeler & Poelt ? Accepted (Eriksson and Hawksworth 1993, Hawksworth et al. 1995) [aparaphysate, saprotrophic, may be subcuticular]

Bryomyces Döbbeler 1978 - *B. scapaniae* Döbbeler ? Accepted (Eriksson and Hawksworth 1993, Hawksworth et al. 1995) [fragmentary paraphyses, on superficial stromatic layer, subcuticular hyphae and haustoria]

Calochaetis Syd. *in* Syd. & Mitter 1935 - *C. indica* Syd. Accepted but probably same as *Dimeriella* (Hansford 1946); = *Wentiomyces* (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995), i.e., *Raciborskiomyces*

Capnobatista Cif. & F.B. Leal ex Bat. & Cif. 1963 - *C. serrulata* Cif. & F.B. Leal = *Wentiomyces* (Eriksson and Hawksworth 1993); = *Trichomerium* (Capnodiaceae) (Reynolds 1982, Hawksworth et al. 1995), i.e., *Phragmocapnias* (Capnodiaceae) (Hughes 1976)

Capnodinula Speg. 1918 - *C. trichodea* (Rehm) Speg. = *Wentiomyces* (Müller and Arx 1962); = *Lasiostemma* (Farr 1979); = *Trichomerium* (Hawksworth et al. 1995), i.e., *Phragmocapnias* (Capnodiaceae) (Hughes 1976)

Ceratosperma Speg. 1918 - *C. theobromae* (Fab.) Speg. = *Nematostoma* (Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Chaetostigme Syd. & P. Syd. 1917 - non desig., lectotype *C. melioloides* Syd. 1924 = *Wentiomyces* (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995); = *Lasiostemma* (Toro 1952, Farr 1979)

Chaetostigmella Syd. & P. Syd. 1917 - *C. papillifera* Syd. & P. Syd. = *Phaeodimeriella* (Hansford 1946, Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Chaetyllis Clem. *in* Clem. & Shear 1931 - *C. polonica* (Siem.) Clem. = *Epipolaeum* (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995); replacement name for *Raciborskiomyces*

Chilemyces Speg. - *C. valparadisiacus* Speg. = *Dimerina* (Petrak and Sydow 1934, Eriksson and Hawksworth 1993, Hawksworth et al. 1995), i.e., probably *Phaeodimeriella*

Dichaetis Clem. *in* Clem. & Shear 1931 - *D. javanicus* (Koord.) Clem. = replacement name for *Wentiomyces*

**Dimeriella* Speg. 1908 - *D. hirtula* Speg. = *Wentiomyces* (Müller and Arx 1962, Arx and Müller 1975); Parodiopsidaceae (Hawksworth et al. 1995); dothideaceous genus, non Parodiopsidaceae (Farr 1979); probably Antennulariellaceae (Barr 1987b); [aparaphysate, ascospores brown, hyphae into stoma and mesophyll]

Dimeriellopsis F.L. Stev. - *D. costaricensis* F.L. Stev. = *Nematostoma* (Sivanesan 1987, Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Dimerina Theiss. 1912 emend. Theiss. & Syd. 1917 - *D. strychni* (Henn.) Theiss. = *D. andirae* (Henn.) Hansf. Accepted (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995), i.e., *Phaeodimeriella*

Dimerinopsis Syd. & P. Syd. 1917 - *D. luzonensis* Syd. & P. Syd. = *Dimerina* (Hansford 1946, Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995), i.e., *Phaeodimeriella*

Dimeriopsis F.L. Stev. 1917 - *D. arthrostylicola* F.L. Stev. = *Dimerina* (Eriksson and Hawksworth 1993, Hawksworth et al. 1995) [ascomata developing beneath mycelial layer]; i.e., perhaps = *Phaeodimeriella*

Dimerium (Sacc. & P. Syd.) McAlpine 1903 - lectotype *D. tasmanicum* (Massee) McAlpine; *Maireella tasmanicum* (Hansford 1954) Correct citation of genus name (Gams 1992)

**Dimerium* Syd. & P. Syd. 1904 - *D. olivaceum* Syd. & P.Syd. Parodiopsidaceae (Hawksworth et al. 1995 in text), Pseudoperisporiaceae (Hawksworth et al. 1995 in list p. 549); asterinalean (Hughes 1993)

Dimerium (Sacc. & P. Syd.) Sacc. & D. Sacc. 1905 lectotype *D. pulveraceum* (Speg.) Theiss. (Theissen and Sydow 1918) Accepted (Hansford 1946, Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993); nom. dub. (Hawksworth et al. 1995)

**Echinothecium* Zopf 1898 - *E. reticulatum* Zopf Capnodiaceae (Müller and Arx 1962, Arx and Müller 1975); Dimeriaceae (Luttrell 1973); ?Capnodiaceae (Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Epibryon Döbbeler 1978 - *E. plagiochilae* (G. Frag.) Döbbeler ? Accepted (Eriksson and Hawksworth 1993; Hawksworth et al. 1995) [aparaphysate, may be immersed or with haustoria]

Epiploca Klebahn 1918 - *E. andromedae* (Rehm) Klebahn = *Epipolaeum* (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995); = *Eudimeriolum* (Barr, new disposition)

Epipolaeum Theiss. & Syd. 1918 - *E. irradians* (Pat.) Theiss. & Syd. Accepted (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995); = *Lasiostemma* (Farr 1979)

Episoma Syd. 1925 - *E. parasiticum* Syd. = *Dimerina* (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993); = *Phaeostigme* (Hawksworth et al. 1995), i.e., *Phaeodimeriella*

Episphaerella Petr. 1924 - *E. manihotis* (Henn.) Petr. Accepted (Hansford 1946, Müller and Arx 1962, Arx and Müller 1975, Farr 1984, Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Eudimeriolum Speg. 1912 - *E. elegans* Speg. Accepted (Hansford 1946, Müller and Arx 1962, Arx and Müller 1975, Farr 1979, Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Eumela Syd. 1925 - *E. chiococcae* Syd. Accepted (Hansford 1946, Müller and Arx 1962, Arx and Müller 1975, Farr 1984, Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Gibbera subg. *Xenogibbera* Petr. 1950 - *G. irradians* (Pat.) Petr. = *Epipolaeum* (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993); = *Lasiostemma* (Farr 1979)

Gomezina Chardon & Toro 1934 - *G. araguata* Chardon & Toro = *Aphanostigme* (Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995), i.e., probably *Nematostoma*

**Hyalomeliolina* F.L. Stev. 1924 - *H. guianensis* F.L. Stev. = *Nematostoma* (Hansford 1946, Arx and Müller 1975, Eriksson and Hawksworth 1993); accepted in Pseudoperisporiaceae (Hawksworth et al. 1995); in Parodiopsidaceae (Sivanesan 1987, Hughes 1993)

Lasiostemma Theiss & Syd. in P. Syd. 1917 - *L. melioloides* (Berk. & M.A. Curtis) Theiss. & Syd. = *Wentiomyces* (Müller and Arx 1962, Arx and Müller 1975); accepted (Farr 1979, Barr 1987b, Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Lasiostemmella Petr. 1950 - *L. sydowii* Petr. = *Epipolaeum* (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995), i.e., probably *Lasiostemma*

**Leptomeliola* Höhn. 1919 - *L. hyalospora* (Lév.) Höhn. = *L. cymbisperma* (Mont.) Hughes = *Nematostoma* (Eriksson and Hawksworth 1993); accepted genus in Parodiopsidaceae (Hawksworth et al. 1995)

Lizonia (Ces. & De Not.) De Not. 1863 - *L. emperigonia* (Auersw.) DeNot. perhaps Parodiellaceae (Barr 1987b); accepted genus in Dimeriaceae (Müller and Arx 1962, Arx and Müller 1975, Döbbeler 1978, Eriksson and Hawksworth 1993), in Pseudoperisporiaceae (Hawksworth et al. 1995)

**Meliolina* Syd. & P. Syd. 1914 - *M. cladotricha* (Lév.) Syd. & P. Syd. Accepted (Arx and Müller 1975); accepted in Meliolinaceae (Hughes 1993, Hawksworth et al. 1995)

Meliolinopsis Beeli 1920 - *M. octospora* (Cooke) Beeli (non F.L.Stev. 1923), for *Patouillardina* G. Arnaud (non Bres. 1906); = *Phaeophragmeriella* (Arx and Müller 1975, Eriksson and Hawksworth 1993); nom. superfl. and based on host in part (Hughes 1993); = *Meliolaster* Höhn. (Asterinaceae) (Hawksworth et al. 1995)

Mirandia Toro 1952 - *M. cordiicola* (Henn.) Toro nom. dub. (Petrak 1951, Müller and Arx 1962, Hawksworth et al. 1995); = *Lasiostemma* (Farr 1979)

Myxophora Döbbeler & Poelt 1978 - *M. amerospora* Döbbeler & Poelt Accepted (Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Nematostigma Syd. & P. Syd. 1913, nom. illeg. (Art. 53.1), non A. Deitr. 1833, Iridaceae - *N. obducens* Syd. & P. Syd. Related to *Parodiopsis* (Parodiopsidaceae) (Hansford 1946); accepted in Dimeriaceae (Arx and Müller 1975, Eriksson and Hawksworth 1993), in Pseudoperisporiaceae (Hawksworth et al. 1995)

Nematostoma Syd. & P. Syd. 1914 - *N. artemisiae* Syd. & P. Syd. = *Lasiosphaeris* (sic) (Clements and Shear 1931); accepted (Hansford 1946, Arx and Müller 1975, Rossman 1987, Sivanesan 1987, Barr 1987b, Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Nematothecium Syd. & P. Syd. 1912 - *N. vinosum* Syd. & P. Syd. Accepted (Arx and Müller 1975, Eriksson and Hawksworth 1993, ? Hawksworth et al. 1995); unitunicate ascomycete (Pirozynski 1976); brightly colored discomycete with bitunicate asci (Rossman 1987)

Neocoleroa Petr. 1935 - *N. sibirica* Petr. = *Wentiomyces* (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995); accepted (Barr, new disposition)

Neodimerium Petr. 1950 - *N. sydowii* Petr. = *Parodiopsis* (Parodiopsidaceae, Arx 1954); = *Epipolaeum* (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995); probably *Lasiostemma*

Ontostheca Bat. *in* Bat. & Cif. 1963 - *O. conglobata* (Berk. & M.A. Curtis) Bat. & Maia *in* Bat. & Cif. = *Eudimeriolum* (Arx in litt., Hawksworth et al. 1995) [described in Capnodiales, Oplotheciaceae]

Ophiogene Petr. 1931 - *O. philippinensis* Petr. =

Nematothecium (Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Phaeocapdinula Speg. 1923 - *P. paulistae* Speg. (as *Phaeocapnodinula* Clem. & Shear 1931) = *Dimerium* (Hansford 1946, Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993); = *Phaeostigme* (Toro 1952, Hawksworth et al. 1995), i.e., probably *Phaeodimeriella*

Phaeodimeriella Speg. 1908 - non desig., lectotype *P. occulta* (Racib.) Theiss. 1912, Theiss. & Syd. 1918 Accepted (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995); lectotype synonym of *P. parvula* (Cooke) Hansf. (Hansford 1946)

Phaeodimeris Clem. & Shear 1931 Replacement name for *Phaeodimeriella*

**Phaeophragmeriella* Hansf. 1944 - *P. meliolicola* (Syd. & P. Syd.) Hansf. Accepted (Arx and Müller 1975, Eriksson and Hawksworth 1993); = *Leptomeliola cryptocarpa* (Ellis & G. Martin) Hughes (Parodiopsidaceae) (Hughes 1993, Hawksworth et al. 1995)

Phaeostigme Syd. & P. Syd. 1917 - *P. piceae* (Berk. & M.A. Curtis) Syd. & P. Syd. = *Dimerium* (Hansford 1946, Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993); accepted to replace *Dimerium* auct. non Syd. & P. Syd. (Hughes 1993, Hawksworth et al. 1995); i.e., *Phaeodimeriella*

**Philonectria* Hara 1914 - *P. variabilis* Hara Accepted (Arx and Müller 1975); Dothideales (inc.sed.) (Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Phragmeriella Hansf. 1946 - *P. ireninae* Hansf. Accepted (Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Phragmodimerium Petr. & Cif. 1932 - *P. insigne* Petr. & Cif. = *Philonectria* (Arx 1954, Arx and Müller 1975); in Dothideales (Hawksworth et al. 1995)

Pilula Massee 1910 - *P. straminea* Massee = *Dimerina* (Eriksson and Hawksworth 1993), sec Clements & Shear 1931 (Hawksworth et al. 1995); i.e., probably *Phaeodimeriella*

Plactogene Theiss. 1917 - *P. lindigii* (Pat.) Theiss. = *Dimerina* (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995), i.e., *Phaeodimeriella*

**Pododimeria* E. Müll. 1959 - *P. gallica* E. Müll. Accepted in Dimeriaceae (Müller and Arx 1962, Arx and Müller 1975, ? Eriksson and Hawksworth 1993), ? in Pseudoperisporiaceae (Hawksworth et al. 1995); disposition ? (Luttrell and Barr 1978); in Parodiellaceae (Barr 1987b)

Porostigme Syd. & P. Syd. 1917 - *P. scheffleri* (Henn.) Syd. & P. Syd. = *Phaeostigme* (Hawksworth et al. 1995)

= *Dimerium* (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993); i.e., *Phaeodimeriella*

Pseudodimerium Petr. 1924 - *P. meliolicola* Petr. = *Dimerium* (Hansford 1946, Arx 1954); = *Phaeostigme* (Hawksworth et al. 1995); i.e., *Phaeodimeriella*

Pseudolizonia Pirotta 1889 - *P. baldinii* Pirotta = *Lizonia* (Döbbeler 1978, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Pseudoperis Clem. *in* Clem. & Shear Replacement name for *Pseudoperisporium* Toro = *Wentiomyces* (Müller and Arx 1962, Arx and Müller 1975); = *Lasiostemma* (by typification)

Pseudoperisporium Toro *in* Seaver and Chardon 1926 - *P. erigeronicola* (F.L. Stev.) Toro = *Lasiostemma* (Farr 1979, Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Raciborskiomyces Siemaszko 1925 - *R. polonicus* Siemaszko = *Epipolaeum* (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995); accepted (Barr, new disposition)

Somatexis Toro *in* Chardon & Toro 1934 - *S. coccolobis* Toro = *Aphanostigme* (Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995), i.e., *Nematostoma*

**Stevensula* Speg. 1923 - *S. monensis* Speg. = *Meliolina* (Clements and Shear 1931); = *Meliolinopsis* (Petrak 1951); = *Phaeophragmeriella* (Arx and Müller 1975, Eriksson and Hawksworth 1993); = *Leptomeliola* (Hughes 1993), in Parodiopsidaceae (Hawksworth et al. 1995)

Stigme Syd. & P. Syd. 1917 - *S. lussoniensis* Syd. & P. Syd. = *Dimerina* (Hansford 1946, Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995); i.e., *Phaeodimeriella*

Toroa Syd. 1926 - *T. dimerosporioides* (Speg.) Syd. Accepted (Hansford 1946, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995)

Wentiomyces Koord. 1907 - *W. javanicus* Koord. = *Dimeriella* (Hansford 1946); accepted (Müller and Arx 1962, Arx and Müller 1975, Eriksson and Hawksworth 1993, Hawksworth et al. 1995); nom. dub. (Farr 1965)

Xenogibbera see *Gibbera* subg. *Xenogibbera*

Several different developmental trends occur among the genera excluded from the Pseudoperisporiaceae. *Acanthostigma* was accepted as an unitunicate genus (Müller 1965) that belongs in the Trichosphaeriaceae (Trichosphaeriales) (Barr 1990).

Pleosporalean taxa include *Pododimeria* which has an entirely different peridium structure from that found in members of the Pseudoperisporiaceae (Luttrell and Barr 1978); the genus has been assigned to the Parodiellaceae (Barr 1987b). Certain genera whose species develop on decaying plant parts or old fungi are typical of the Tubeufiaceae, such as *Acanthophiobolus* with elongate, filiform ascospores coiled in the ascus (Barr, new disposition), and perhaps *Acanthostigmella* with shorter, several-septate ascospores (Untereiner et al. 1995), although pseudoparaphyses are absent and the genus appears to be better disposed in the Herpotrichiellaceae (Barr 1977, 1991).

Asterinalean taxa in the Parodiopsidaceae probably include both *Hyalomeliolina* and *Leptomeliola* (Sivanesan 1987, Hughes 1993). *Meliolina* is the type genus of family Meliolinaceae (Hughes 1993).

Capnodialean taxa in the Antennulariellaceae are *Antennulariella* (Hughes 1976) and *Dimeriella* (Farr 1979, Barr 1987b). Other probably capnodialean fungi are *Philonectria* (Dothideales inc. sed., Hawksworth et al. 1995), *Capnobatista*, and *Echinothecium*. *Eudimeriolum tsugae* (Dearn.) M.L. Farr has beem removed from that genus and indeed from the family. The fasciculate asci lack any paraphysoidal tissues, and this dothideaceous feature required that a separate genus *Rasutoria* M.E. Barr be erected to accommodate this and other species in the Euantennariaceae (Barr 1987a).

KEY TO ACCEPTED GENERA OF THE PSEUDOPERISPORIACEAE

1. Biotrophic, mycelium forming subcuticular layer, stomatopodia and haustoria, or intercellular hyphae in addition to superficial mycelium; ascospores 1-septate...2

1. Hyperbiotrophic or biotrophic, mycelium superficial only...4

    2. Internal mycelium sparse, forming subcuticular layer, ascomata glabrous, bearing hyphal appendages or short, bluntly ended, branched or lobed setae..... *Lasiostemma*

    2. Internal mycelium more extensive, ascomata glabrous or bearing hyphal appendages..............3

3. Internal mycelium forming stomatopodia and haustoria within epidermal cells...........................*Eumela*

3. Internal mycelium intracellular within leaf tissues.... *Episphaerella*

    4. Hyperbiotrophic, usually on meliolalean or asterinalean leaf biotrophs; ascomata glabrous or bearing protruding cells or short, bluntly ended, uncinate appendages; ascospores usually 1-septate............ *Phaeodimeriella*

    4. Biotrophic on green plants, often around trichomes (occasionally on lichens or mosses)................5

5. Ascomata glabrous or roughened by protruding cells or few hyphal appendages; ascospores 1-septate.............6

5. Ascomata setose around apex; ascospores 1- or several-septate..7

    6. On *Polytrichum*..............................*Lizonia*

    6. On vascular plants..................*Eudimeriolum*

7. Setae short, blunt and strongly lobed or furcate at tips; ascospores 1-septate...................*Neocoleroa*

7. Setae short to elongate, tapered to pointed tips......8
    8. Ascospores 1-septate.............*Raciborskiomyces*
    8. Ascospores several-septate............*Nematostoma*

Three genera are accepted whose species produce some internal mycelium. Species of ***Lasiostemma*** form a narrow subcuticular hyphal layer. Farr (1979) recognized two subgenera in *Lasiostemma*. In subgenus *Lasiostemma* the ascomata are glabrous or form indeterminate hyphal appendages. Here are included two species of warm to tropical climates on members of the Asteraceae, *L. melioloides* and *L. irradians* (Pat.) M.L. Farr. In subgenus *Setostemma* M.L. Farr the ascomata bear setae that are blunt and frequently lobed at the tips. The type species, *L. cordiicola* (Henn.) M.L. Farr, is another species of warm to tropical regions on Asteraceae. *Lasiostemma erysipheoides* (Ellis & Everh.) M.L. Farr is widely distributed on members of Poaceae (Farr 1966), known from Cambodia, India, Trinidad, and in USA from Alabama, Florida, Oklahoma, Texas, and Wisconsin. Additional species are *L. maesae* (Hansf.) M.L. Farr (1985) from Uganda and Ecuador, and *L. minutum* M.L. Farr (1987), which has a well developed subcuticular hypostroma.

The hyphae in species of ***Eumela*** form stomatopodia and penetrate epidermal cells, including guard cells, with a hyphal layer and sometimes haustoria. Farr (1984) described and illustrated *Eumela chiococcae* and *E. pannosa* (Speg.) M.L. Farr, both biotrophic on leaves of tropical Rubiaceae. Pycnidia that contain minute conidia are associated with these species.

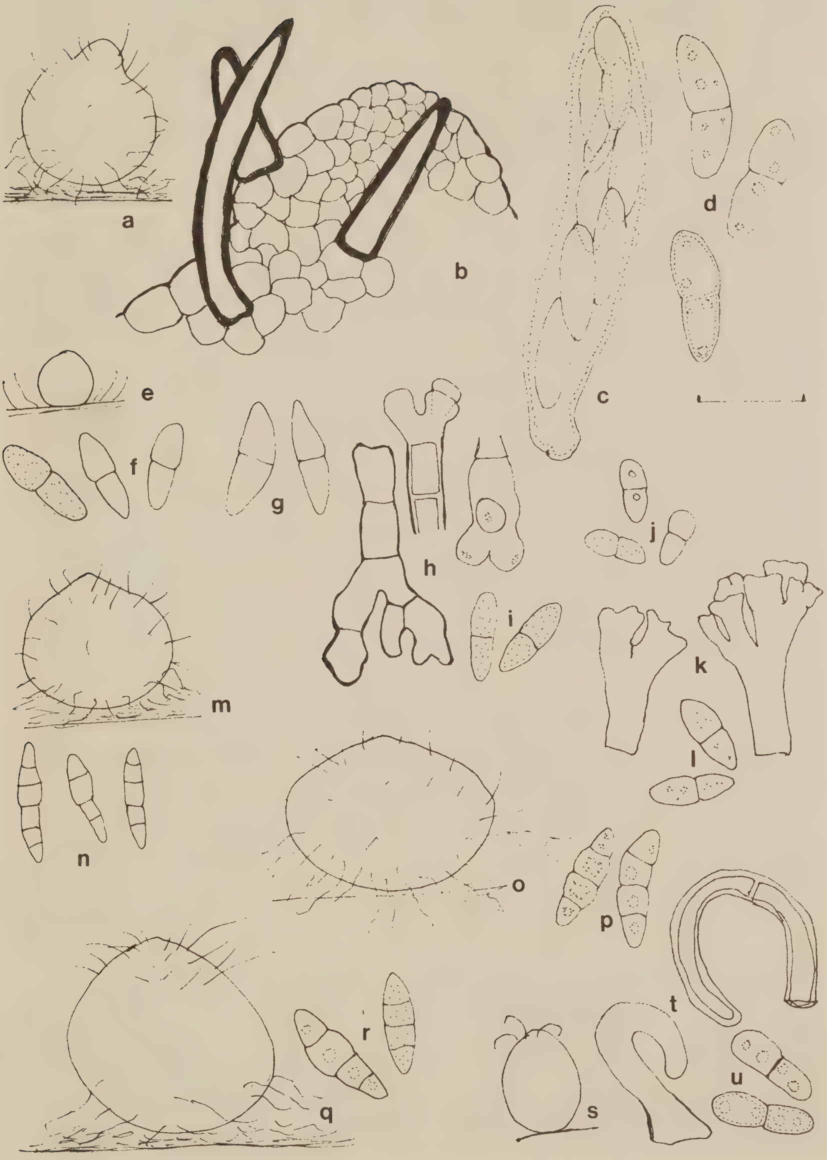
The type species of ***Episphaerella***, *E. manihotis*, was redescribed by Müller & Arx (1962) following Arnaud. It forms only limited superficial mycelium but extensive intracellular mycelium. *Episphaerella dodonaeae* (F.L. Stev.) M.L. Farr, Schoknecht & J.L. Crane was redescribed from Florida collections and transferred to the genus (Farr et al. 1985).

The hyperbiotrophic taxa show great similarity in substrate preferences (asterinalean or meliolalean superficial biotrophs), minute to small ascomata, asci with few pseudoparaphyses at maturity, ascospore shape and septation, and associated anamorphs. They have been separated, usually into the three genera *Dimerium*, *Phaeodimeriella* and *Dimeriella* (Müller and Arx 1962, Luttrell 1973, Arx and Müller 1975), without emphasizing ascospore pigmentation, or into *Dimerium* and *Phaeodimeriella* on the bases of ascospore pigmentation combined with ascomatal vestiture (Barr 1987b). Both of these features are variable among the species of the other genera accepted in the family. For consistency in treatment, it is reasonable to include the hyperbiotrophic species having uniseptate hyaline to light brown ascospores and varying in vestiture in the genus ***Phaeodimeriella***, lectotypified by *P. parvula*. As a consequence numerous genera fall into synonymy under *Phaeodimeriella*. [*Phragmeriella* is known from *P. irenicola* in Africa, and has setose ascomata and three-septate ascospores. I have seen no material of this fungus.] The degree of vestiture of ascomata varies among the species of *Phaeodimeriella*, for example, a few septate, uncinate, bluntly ended setae in *P. parvula* and related species (Fig. 1,s-u), short protruding dark cells or hyphal tips in *P. langloisii* (Ellis & G. Martin) M.E. Barr, comb. nov. (basionym: *Dimerosporium langloisii* Ellis & G. Martin, J. Mycol. 2: 129. 1886), quite glabrous in *P. meliolicola* (Petr.) M.E. Barr. comb. nov. (basionym: *Pseudodimerium meliolicola* Petr., Ann. Mycol. 22: 21. 1924) (Chen and Hsieh 1996 as *Dimerium*). The associated anamorphs are small pycnidia of similar aspect to the ascomata, that produce minute hyaline or light brown, unicellular conidia. These anamorphs have been assigned to *Ectosticta* Speg. or *Cicinnobella* Henn. (synonym *Asbolisia* Speg., Hughes 1993). Details of many species have been provided by Hansford (1946), Müller and Arx (1962), and Farr (1985).

Those genera whose species are biotrophic, usually around trichomes, may produce delicate strands that penetrate the epidermal outgrowths. Eventually internal mycelium may also develop in the dead host tissue after overwintering (Nüesch 1960).

Eudimeriolum was reappraised by Farr (1979). She recognized two subgenera, but in this evaluation only one is accepted. Members of subgenus *Setocarpum* are interpreted as belonging in *Raciborskiomyces*, a genus reinstated to accommodate taxa having dark setae that taper to a point. The ascomata of species in *Eudimeriolum* in the narrow sense are glabrous or bear blunt-ended hyphal appendages.

Plate 1. Pseudoperisporiaceae. a-d. *Raciborskiomyces garryanus*, a. ascoma in outline, b. apex bearing setae, c. ascus, d. ascospores. From holotype. e,f. *Eudimeriolum andromedae*, e. ascoma in outline, f. ascospores. From Ontario specimen. g. *E. plantaginis*, ascospores. From isotype. h,i. *Neocoleroa fimbriata*, h. appendages, i. ascospores. From holotype. j. *N. gallica*, ascospores. From Rhode Island specimen. k, l. *N. molarifera*, k. appendages, l. ascospores. From K. & L. Holm 2819a. m,n. *Nematostoma garryae*, m. ascoma in outline, n. ascospores. From NAF 2052. o,p. *N. artemisiae*, o. ascoma in outline, p. ascospores. From NAF 2141. q,r. *N. parasiticum*, q. ascoma in outline, r. ascospores. From Ontario specimen. s,t,u. *Phaeodimeriella* cf. *parvula*, s. ascoma in outline, t. appendages, u. ascospores. From Heller, Pl. Porto Rico 6386. Standard line = 150 µm for a,m,o,q,s, 15 µm for other figures.


a
b
c
d
e
f
g
h
i
j
k
l
m
n
o
p
q
r
s
t
u

Müller and Arx (1962) redescribed *E. elegans*, the type species, from Tiliaceae. Farr (1979) described *E. liabi* (Syd.) M.L. Farr and *E. hirtuloides* M.L. Farr, also from South America, occurring on members of the Asteraceae. Farr transferred two taxa on Poaceae, *E. pumilum* (Petr.) M.L. Farr and *E. dissemination* (Syd.) M.L. Farr, to the genus, referring to her earlier descriptions (Farr 1966). A warm-temperate species, *E. septentrionale* M.L. Farr & Luttrell (1979), on *Betula* leaves and twigs from Georgia, developed pycnidia filled with minute conidia in culture. Two other temperate-zone species evidently belong here.

Eudimeriolum andromedae (Rehm) M.E. Barr, comb. nov. Fig. 1,e,f. (basionym: *Stigmatea andromedae* Rehm, Ber. Naturhist. Vereins Augsberg 26: 130. 1881.) This species was made the type of *Epiploca* Klebahn (Haupt- Nebenfr. Ascomyc. 167. 1918) and was arranged in *Epipolaeum* by Arx in Müller and Arx (1962). It was described from leaves of *Andromeda polifolia* L. in Europe and occurs in North America on *A. glaucophylla* Link. Specimens from Ontario (as *Venturia cassandrae*, London, 13 Aug 1910, J. Dearness, and Rehm Ascomyc. 2017, both in BPI) and Maine (Orono, 27 Jul 1985, M.L. Fernald, in NY) are identical with Swedish collections (Rehm Ascomyc. 542b isolectotype, Vestergren, Micromyc. rar. sel. 364, both in BPI). B. Eriksson (1974) pointed out that the original collection was distributed in 1879, although the fungus was not described until 1881.

Eudimeriolum plantaginis (Tehon & E.Y. Daniels) M.E. Barr, comb. nov. Fig. 1,g (basionym: *Stigmatea plantaginis* Tehon & E.Y. Daniels, Mycologia 19: 111. 1927.) The fungus was described as subcuticular in small leaf spots but isotype specimens (Illinois: Hancock Co., Carthage, 24 Jul 1922, 7652, in NY; ILLS 6924, same data) showed superficial ascomata among the trichomes as well as on dull brown spots. The ascomata bear hyphal appendages that merge with the superficial mycelium which surrounds and penetrates the trichomes. Asci and ascospores are as they are described in the original description.

Two small species that develop on the sunken midribs of leaves of *Empetrum* and *Dryas* respectively probably belong in *Eudimeriolum* rather than *Epipolaeum*, *i.e.* *Lasiostemma*, where they have been arranged. These species are *E. sulcicola* B. Erikss. (1974) and *E. absconditum* (Johans.) L.Holm (1979).

Lizonia De Not. has glabrous ascomata and one-septate ascospores, and develops on species of *Polytrichum*. Barr (1987b) tentatively arranged the genus in the Parodiellaceae, but it is better disposed in the Pseudoperisporiaceae (Hawksworth et al. 1995), or as Dimeriaceae (Müller and Arx, 1962, Arx and Müller 1975, Döbbeler 1978). Döbbeler recognized four species on *Polytrichum* in Europe, mostly necrotrophic. Only *L. baldinii* (Pirotta) Döbbeler has been reported from Alaska in North America. In his major contribution to knowledge of ascomycetes on mosses, Döbbeler (1978) added to the family several other taxa, *Bryochiton* Döbbeler & Poelt, *Bryomyces* Döbbeler, *Epibryon* Döbbeler, and *Myxophora* Döbbeler & Poelt, for which I have seen no representatives.

Wentiomyces was described from Java, and Müller and Arx (1962), Arx and Müller (1975) took up the name for several taxa. Eriksson and Hawksworth (1993) and Hawksworth et al. (1995) have also accepted *Wentiomyces*. The type species, *W. javanicus* Koord. has vestiture composed of short stiff setae whose tips are blunt and lobed or furcate. The species was described as aparaphysate (Koorders 1907, Müller and Arx 1962). Bose and Müller (1964) described a collection that is similarly aparaphysate; it developed on empty ascomata of *Neophacidium quercus* (Chona, Munjal & Kapoor) E.Müll. & Ahmad in India. Farr (1965) regarded the genus as doubtful and proposed that it be designated as *nomen dubium*, because the type specimen was not available and the fungus was described from sparse and immature material. I agree with that decision, with the proviso that the Bose and Müller collection indicates that such a taxon, having bluntly lobed tips to the short setae and aparaphysate asci in a fascicle, may belong among dothidealean genera. To replace *Wentiomyces*, *Neocoleroa* and *Raciborskiomyces* are reinstated for taxa whose setae are blunt-tipped and lobed to furcate or sharply pointed, respectively.

Neocoleroa accommodates several species that are in accord with the description of *N. sibirica*, the type species, which has bluntly ended, lobed and furcate stiff setae at the apex, and hyaline or lightly pigmented, uniseptate ascospores. The related taxa all form minute to small ascomata, 40-100(-150) µm, that bear a crown of short blunt-tipped and often lobed or furcate setae as well as dependent hyphal appendages that merge with the basal tomentum. The oblong to saccate asci arise from a basal layer among sparse pseudoparaphyses.

A second species is **Neocoleroa fimbriata** (Dearn. & House) M.E. Barr, comb. nov. Fig. 1,h,i. (basionym: *Venturia fimbriata* Dearn. & House, New York State Mus. Bull. 233-234: 43. 1921). This species was assigned to *Wentiomyces* (Barr 1968) and later to *Lasiostemma* (Barr 1987a), based upon similarities of furcate appendages. The entirely superficial mycelium negates the latter transfer. The species is close to *N. sibirica* in sizes and in the acutely ended ascospores, 8-10.5 x 2-3 µm. It has been reported on species of *Achillea*, *Antennaria*, *Saxifraga*, *Silene*, and *Vaccinium* (Barr 1968) from subarctic and alpine Quebec, alpine British Columbia, as well as from Maryland, New Hampshire, and New York in USA. A recent collection from British Columbia (M.E. Barr 9040, DAOM) develops in a typical fashion in the canescence of leaves of *Anaphalis margaritacea* (L.) Benth. & J.D. Hook.

Another species is **Neocoleroa gallica** (E.Müll.) M.E. Barr, comb. nov. Fig. 1,j. (basionym: *Epipolaeum gallicum* E. Müll., Sydowia 18: 93. 1965), described from *Quercus ilicis* L. in France, and known from *Q. ilicifolius* Wangenh. in the USA from Rhode Island (Exeter Co., Beach Pond State Park, 21 Jul 1966, M.E.Barr 4828, NY).

Two lichenicolous taxa are transferred to *Neocoleroa* on the basis of the apical setae. ***Neocoleroa lichenicola*** (Hansf.) M.E. Barr comb. nov. (basionym *Dimeriella lichenicola* Hansf. Proc. Linn. Soc. London 157: 186. 1946) subsp. ***lichenicola*** is known only from Uganda (Hawksworth 1980). ***Neocoleroa lichenicola*** subsp. ***bouteillei*** (Bricaud, Cl. Roux & Sérus.) M.E. Barr, comb. nov. (basionym *Wentiomyces lichenicola* subsp. *bouteillei* Bricaud, Cl.Roux & Sérus., Mycotaxon 50: 461. 1994) ranges from southern Europe and Asia to South America. These taxa differ in their parasitic specialization, distribution, and aspects of the anchoring hyphae (Roux et al. 1994). The numerous furcate appendages are one or two septate and the obtusely ended ascospores measure (9.5-)10.5-14.5(-16) x (2.5-)4-5(-6) µm.

Hawksworth and Sivanesan (1976) recorded a collection as *N. sibirica* on *Filipendula* in Great Britain; a collection on the same host from Sweden (K. & L. Holm 2819a) is similar. Eriksson (1992) has reported the taxon from Sweden as *Wentiomyces fimbriatus* (Dearn. & House) M.E. Barr. Illustrations of the British collection in addition to specimens of the Swedish material examined show lobed flat-topped apices to the short dark, non-septate setae, similar to those of *Wentiomyces molarifer* Scheuer, another taxon that belongs in *Neocoleroa* as **Neocoleroa molarifera** (Scheuer) M.E. Barr, comb. nov. Fig. 1 k,l. (basionym *Wentiomyces molarifer* Scheuer, Bibl. Mycol. 128: 182. 1988). This species, described from *Carex* in Austria (Scheuer 1988), forms obtusely ended ascospores measuring (7.5-)9-12.5 x 2.5-4 µm.

In another recently described species, *W. alpivagus* Nograsek (1990), the ascospores are obtusely ended and larger, 8-16 x 2-4 µm; the species was described from Sweden on *Silene acaulis* L., also from Austria on *Carex* and *Saxifraga*. This species too must be transferred, thus ***Neocoleroa alpivaga*** (Nograsek) M.E. Barr, comb. nov. (basionym *Wentiomyces alpivagus* Nograsek, Bibl. Mycol. 133: 228. 1990).

The illustrations of *W. dryadis* K. Holm & L. Holm (Holm and Holm 1993) make it obvious that the species belongs in *Neocoleroa*. Its transfer as ***Neocoleroa dryadis*** (K. Holm & L. Holm) M.E. Barr, comb. nov. (basionym *Wentiomyces dryadis* K. Holm & L. Holm, Bibl. Mycol. 150: 61. 1993) is proposed. This is a minute fungus whose ascomata reach 50-70 µm and ascospores 8-10 x 2 µm.

Among the genera that had been assigned to *Epipolaeum* is ***Raciborskiomyces***. The genus must be reinstated to accommodate superficial taxa that typically inhabit trichomes, with acutely pointed setae around the ascomatal apex, and uniseptate ascospores.

The type species is **Raciborskiomyces longisetosus** (Volkart) M.E. Barr comb. nov. (basionym: *Venturia longisetosa* Volkart, Engl. Bot. Jahrb. 47: 513. 1913), an earlier name than *R. polonicus*. Nüesch (1960) recognized the congruence of *V. longisetosa* and *R. polonicus*, transferred the species to *Epipolaeum*, and described and illustrated it. North American collections on *Salix* sp. are known from Newfoundland: Labrador, 25 Jul 1957, R.T. Wilce 182 (NY); on *Salix bebbiana* Sarg. from Quebec: Oka, 30 May 1957, M.E. Barr 1846 (NY).

Another species is **Raciborskiomyces volkartianus** (E.Müll.) M.E. Barr, comb. nov. (basionym: *Gibbera volkartiana* E. Müll., Sydowia 8: 66. 1954. This fungus was transferred to *Epipolaeum* by Müller in Müller & Arx (1962) and was designated as the type species of *Eudimeriolum* subg. *Setocarpum* M.L. Farr (Farr 1979), when she described and illustrated that taxon. It fits well in *Raciborskiomyces*.

One new species is described here from North America.

Raciborskiomyces garryanus M.E. Barr & Rogerson, sp. nov. Fig. 1, a-d

Ascomata hypophylla globosa 165-220 µm diametro, setae nigrescentes 30-45 µm longae ostiolum papillatum cingens. Asci bitunicati 70-90 x 10 µm oblongi pseudoparaphysati. Ascosporae 16-19 x 5-6 µm brunneae obovoideae obtusae uniseptatae biseriatae. Holotypus in foliis *Garryae flavescentis* S. Wats. "USA: Utah: Washington Co., along Leeds Creek, W. of Leeds, Pine Valley Mountains, Dixie Nat'l Forest, 1 Sep 1988", a C.T. Rogerson lectus in NY depositus.

Mycelium forming dark gray blotches, hypophyllous on leaf surface, surrounding trichomes. Ascomata 165-220 µm, globose; apex abruptly short papillate with dark, upright setae around papilla, 30-45 µm long, 5-6 µm wide at base, nonseptate; dependent hyphae from lower sides, mingling with mycelium; peridium narrow, two rows of brown, pseudoparenchymatous cells. Asci 70-90 x 10 µm, oblong; pseudoparaphyses few, cellular. Ascospores 16-19 x 5-6 µm, light dull brown, obovoid, ends obtuse, 1-septate, median or submedian, upper cell wider than lower, inequilateral to slightly curved; wall smooth; two globules per cell; overlapping biseriate in the ascus.

Known from the type collection.

A species that develops on dead thalli of *Peltigera* was referred to *Wentiomyces* with some hesitation as *W. peltigericola* D. Hawksw. (1980). This taxon forms simple, pointed setae and uniseptate ascospores, 12-16 x 3.5-4.5 µm. It is transferred to *Raciborskiomyces* as **R. peltigericola** (D. Hawksw.) M.E. Barr, comb. nov. (basionym

Wentiomyces peltigericola D. Hawksw., Trans. Brit. Mycol. Soc. 74: 384. 1980).

Taxa with setose ascomata, quite similar to those of *Eudimeriolum* and *Raciborskiomyces* except for the hyaline or lightly pigmented phragmospores, are assigned to ***Nematostoma***. [*Toroa* is a tropical phragmosporous taxon with glabrous ascomata. I have seen no representatives of this genus.] The type species of *Nematostoma*, *N. artemisiae*, was redescribed by Sivanesan (1987); the ascomata bear pointed, septate setae and the ascospores are three-septate, hyaline to brownish, 14-16 x 3.5-4 µm.

Sivanesan studied the type species of *Dimeriellopsis*, *D. costaricensis*, and was forced to propose a new name, *N. costaricana* Sivan. because of *N. costaricensis* (F.L. Stev.) Hansf. [non *Hyalomeliolina costaricensis* F.L. Stev. 1923, which does belong in *Hyalomeliolina* in the Parodiopsidaceae]. In *N. costaricana* the ascospores are typically two-septate, occasionally three- to four-septate, 25-32 x 5.5-7 µm.

Rossman (1987) added as generic synonym *Aphanostigme* with the type species *A. solani* whose ascospores are hyaline, but whose other features are identical with those of *Nematostoma*. Rossman did not propose transfer of that species, although she did transfer from *Calonectria* another species as *N. hoehnelii* (Rehm) Rossman, which is a Brazilian fungus having medium-sized, dark red ascomata. *Acanthostigma erysiphoides* (Rehm) E.Müll. probably belongs in *Nematostoma* also, according to Müller's (1965) description and illustration.

It is quite likely that the taxon named *Pleospora delicatula* (Vestergr.) Wehm. belongs to *Nematostoma*. The small, setose ascomata are superficial on trichomes of *Cerastium tomentosum* L. in Europe. The three-septate ascospores often contain a longitudinal or angular septum in one or two cells (Crivelli 1983). Crivelli pointed out the differences from *Dictyotrichiella* (=*Capronia*) where Eriksson (1981) had transferred the species.

Several species bear an associated anamorph with setose pycnidia and hyaline, small, one celled or one-septate conidia. *Nematostoma occidentale* (Ellis & Everh.) M.E. Barr (Canad. J. Bot. 46: 861. 1968) has light yellowish brown, three-septate ascospores, 20-25.5 x 4.5-5.5 µm, and develops on leaves of species of *Cirsium*. Crane (1971) studied *Chaetosticta perforata* (Ellis & Everh.) Petr. & Syd., the presumed anamorph of *N. occidentale*, in some detail; he was unable to confirm a connection, because neither ascomata nor pycnidia developed in culture. Both ascomata and pycnidia are strikingly similar in aspect. The taxon described as *Acanthostigma occidentale* var. *minor* Ellis & Everh. (1892) on leaves of *Artemisia ludoviciana* Nutt. (Fig. 1 o,p), is somewhat smaller in all respects than the species, and the sizes are more in accord with those of *N. artemisiae*.

Two additional taxa are transferred to the genus. ***Nematostoma garryae*** (Höhn.) M.E. Barr, comb. nov. Fig. 1, m,n. (basionym: *Lasiosphaeria garryae* Höhn., Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. 1, 118: 361. 1909.)

Ascomata superficial, 220-300 µm, setae from upper region of wall, septate or not, 40-100 µm long, brown hyphal appendages from lower sides merging with basal mycelium; peridium of brown, pseudoparenchymatous cells, ca. 20 µm wide. Asci 70-80(-96) x 7-11 µm; pseudoparaphyses cellular. Ascospores 17-20 x 3.5-4.5 µm, hyaline, fusoid, 3-5-septate, constricted at the primary septum; wall smooth; homogeneous; overlapping biseriate in the ascus. Associated pycnidia similar in size and aspect to ascomata; conidia 8-12.5 x 2-3 µm, hyaline, oblong, 1-septate.

On living leaves of *Garrya elliptica* Douglas ex Lindl.

Material examined: USA: California: Tamalpais, May, H.W. Harkness, NAF 2052 (NY) as *Phillipsiella purpurea* W. Phillips & Harkn.

Höhnel (1909) described this species from Rabenh.-Winter F. eur. 3270, which forms part of the type collection. At the same time he described and illustrated *Phillipsiella purpurea* and indicated that it, made the type of *Harknessiella* by Saccardo (Syll. Fung. 8: 845. 1889), belonged in *Coryne* as *C. purpurea* (W. Phillips & Harkn.) Höhn. This discomycetous species he found only on one collection in Saccardo's herbarium. It is not present on the NAF collection that I examined. *Aphanostigme lanugine* V.M. Miller & Bonar (Univ. California Publ. Bot. 19: 412. 1941) is a probable synonym, according to the description.

Nematostoma parasiticum (R. Hartig) M.E. Barr, comb. nov. Fig. 1,q,r. (basionym: *Trichosphaeria parasitica* R. Hartig, Allg. Forst- Jagd-Zeitung (Vienna) 60: 1884.) has additional synonymous names: *Herpotrichia parasitica* (R. Hartig) Rostr. Tidsskr. Skogbr. 12: 222. 189, and *Acanthostigma parasitica* (R. Hartig) Sacc. Syll. Fung. 9: 855. 1891. This taxon was assigned to *Herpotrichia* by Freyer and van der Aa (1975) who redescribed it as well as discovering and describing the anamorph, *Pyrenochaeta parasitica* Freyer & Aa. Munk (1957) listed it under *Acanthostigma* and observed that it "has nothing to do with the coarse-fruited, black-tomentous *Herpotrichiae*." I agree; peridium structure of *N. parasiticum* differs from that of species in *Herpotrichia* in pigmentation and thickness. Additionally, the ascospores of *N. parasiticum* are more asymmetric, with a strong tendency to be inequilateral or slightly curved. A collection from Ontario (Nipissing District, Lake Timagami, Bear Island, 26 Aug 1925, G.D. Darker 1578, NY) agrees well with material of the species from Denmark and Switzerland.

Some other taxa that appear to belong in the family are known at present from single or sparse collections; these await the discovery of richer material before they too are presented to science.

ACKNOWLEDGMENTS

I greatly appreciate the comments and suggestions made by the presubmission reviewers of this manuscript, Drs. S.J. Hughes and C.T. Rogerson. Their input was vital to the content and its presentation. The curators of herbaria cited are thanked for the loan of collections in their keeping.

LITERATURE CITED

Arx, J.A. von. 1954. Revision einiger Gattungen der Ascomyceten. Acta Bot. Neerlandica 3: 83-93.

_____ and E. Müller. 1975. A re-evaluation of the bitunicate Ascomycetes with keys to families and genera. Stud. Mycol. (Baarn) 9: 1-159.

Barr, M.E. 1968. The Venturiaceae in North America. Canad. J. Bot. 46: 799-864.

_____. 1977. *Acanthostigmella* (Herpotrichiellaceae). Mycotaxon 6: 17-23.

_____. 1987a. New taxa and combinations in the Loculoascomycetes. Mycotaxon 29: 501-505.

_____. 1987b. Prodromus to Loculoascomycetes. Publ. by the author, Amherst, MA. 168 p.

_____. 1990. Prodromus to nonlichenized, pyrenomycetous members of class Hymenoascomycetes. Mycotaxon 39: 43-184.

_____. 1991. Notes on and additions to North American members of the Herpotrichiellaceae. Mycotaxon 41: 419-436.

Bose, S.K. and E. Müller. 1964. Central Himalayan fungi-I. Indian Phytopathology 17: 3-22.

Chen, C.Y. and W.H. Hsieh. 1996. Two new species and some new records of ascomycetes from Taiwan. Bull. Bot. Acad. Sin. 37: 219-227.

Clements, F.E. and C.L. Shear. 1931. The genera of fungi. H.W. Wilson Co., New York. 496 p. + 58 pl.

Crane, J.L. 1971. Illinois fungi I. *Chaetosticta*. Canad. J. Bot. 49: 31-34.

Crivelli, P.G. 1983. Ueber die heterogene Ascomycetengattung *Pleospora* Rabenh.; Vorschlag für eine Aufteilung. Dissert. ETH Zurich 7318: 1-213.

Döbbeler, P. 1978. Moosbewohnende Ascomyceten I. Mitt. Bot. München 14: 1-360.

Ellis, J.B. and B.M. Everhart. 1892. The North American Pyrenomycetes. Publ. by the authors, Newfield, NJ. 793 p.

Eriksson, B. 1974. On Ascomycetes on Diapensiales and Ericales in Fennoscandia 2. Pyrenomycetes. Svensk

Bot. Tids. 68: 192-234.

Eriksson, O.E. 1981. The families of bitunicate ascomycetes. Opera Bot. 60:1-220.

_____. 1992. The non-lichenized pyrenomycetes of Sweden. SBT-forlaget, Lund, Sweden. 208 p.

_____ and D.L. Hawksworth. 1993. Outline of the ascomycetes - 1993. Syst. Ascomyc. 12: 51-257.

Farr, M.L. 1965. *Dimeriella*, *Wentiomyces*, *Episphaerella*, and *Epipolaeum* (Fungi: Pyrenomycetes). Taxon 14: 18-21.

_____. 1966. The didymosporous dimeriaceous fungi described from leaves of Gramineae. Mycologia 58: 221-248.

_____. 1979. The didymosporous dimeriaceous fungi described on Asteraceae. Mycologia 71: 243-271.

_____. 1984. The didymosporous dimeriaceous fungi reported on leaves of Rubiaceae. Mycologia 76: 793-803.

_____. 1985(1986). Notes on mostly neotropical fungi. Sydowia 38: 65-74.

_____. 1987. Amazonian foliicolous fungi. IV. Some new and critical taxa in Ascomycotina and associated anamorphs. Mycologia 79: 97-116.

_____ and E.S. Luttrell. 1979. A new species of *Eudimeriolum* from Georgia. Mycologia 71: 1269-1274.

_____, J.D. Schoknecht, and J.L. Crane. 1985. A Costa Rican black mildew found in Everglades National Park, Florida. Canad. J. Bot. 63: 1983-1986.

Freyer, K. and H.A. van der Aa. 1975. Über *Pyrenochaeta parasitica* spec. nov., die Nebenfruchtform von *Herpotrichia parasitica* (Hartig) E.Rostrup (=*Trichosphaeria parasitica* Hartig). Eur. J. For. Pathol. 5: 177-182.

Gams W. 1992. [Report of the Committee for Fungi and Lichens: new series, 2. Taxon 41: 99-108].

Hansford, C.G. 1946. The foliicolous ascomycetes, their parasites and associated fungi. Mycol. Pap. 15: 1-240.

_____. 1954. Australian fungi II. New records and revisions. Proc. Linn. Soc. New South Wales 79: 97-141.

Hawksworth, D.L. 1980. Notes on some fungi occurring on *Peltigera*, with a key to accepted species. Trans. Brit. Mycol. Soc. 74: 363-386.

_____ and J.C. David. 1989. Family names. Index Fungi Suppl. CAB Int. Mycol. Inst., Wallingford, GB. 75 p.-

_____ and O.E. Eriksson. 1988. [(895)-(906) Proposals to conserve 11 family names in the Ascomycotina (Fungi). Taxon 37: 190-193].

_____, P.M. Kirk, B.C. Sutton and D.N. Pegler. 1995. Ainsworth & Bisby's Dictionary of the fungi. 8th ed. CAB International, Wallingford, UK. 616 p.

_____ and A. Sivanesan. 1976. New and interesting microfungi from Slapton, South Devonshire: Ascomycotina III. Trans. Brit. Mycol. Soc. 67: 477- 483.

Höhnel, F. von. 1909. Fragmente zur Mykologie. 244. Revision der Myriangiaceen und der Gattung *Saccardia*. Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Kl. Abt. 1, 118: 349-376.

Holm, K. and L. Holm. 1993. Dryadicolous Ascomycetes from Svalbard. Bibl. Mycol. 150: 53-62.

Holm, L. 1979. Microfungi on *Dryas*. Bot. Not. 132: 77-92.

Hughes, S.J. 1976. Sooty moulds. Mycologia 68: 693-820.

_____. 1993. *Meliolina* and its excluded species. Mycol. Pap. 166: 1-255.

Jenkins, A.E., H.P. Krug and E.R. Cash. 1941. New or little known ascomycetes collected in Sao Paulo in 1936. Mycologia 33: 390-404.

Koorders, S.H. 1907. Botanische Untersuchungen über einige in Java vorkommende Pilze, besonders über Blatter bewohnende, parasitisch auftretende Arten. Verh. K. Akad. Wet. Amsterdam 13(4): 1-264.

Luttrell, E.S. 1973. Loculoascomycetes. Ch. 7, pp. 135-218, In: The Fungi. Vol. IVA. Eds., G.C. Ainsworth, F.K. Sparrow, and A.S. Sussman. Academic Press, New York.

_____ and M.E. Barr. 1978. Additional species of *Pododimeria* (Loculoascomycetes). Amer. J. Bot. 65: 251-257.

McAlpine, D. 1903. Australian Fungi, new or unrecorded. Proc. Linn. Soc. New South Wales 28: 94-103.

Müller, E. 1965. Beobachtungen an Ascomyceten. Sydowia 18: 86-105.

_____ and J.A. von Arx. 1962. Die Gattungen der didymosporen Pyrenomyceten. Beitr. Kryptogamenfl. Schweiz 11(2): 1-922.

Munk, A. 1957. Danish Pyrenomycetes. Dansk Bot. Ark. 17(1): 1- 491.

Nograsek, A. 1990. Ascomyceten auf Gefässpflanzen der Polsterseggenraum in den Ostalpen. Biblioth. Mycol. 133: 1-277.

Nüesch, J. 1960. Beitrag zur Kenntnis der weidenbewohnender Venturiaceae. Phytopathol. Z. 39: 329-360.

Petrak, F. 1949. *Bimeris* nov. gen., eine neue Gattung der Sphaeropsideen aus Ekuador. Sydowia 3: 251-255.

_____. 1950. *Lasiostomella*, eine neue Gattung der Dimerieen. Sydowia 4: 376-380.

_____. 1951. Ergebnisse einer Revision der Grundtypen verschiedener Gattungen der Ascomyceten und Fungi imperfecti I und II. Sydowia 5: 169-198, 328-356.

_____ and H. Sydow. 1934. Kritisch-systematische Originaluntersuchungen uber Pyrenomyceten, Sphaeropsideen und Melanconieen V, Nrn. 226-250. Ann. Mycol. 32: 1-35.

Pirozynski, K.A. 1976. Notes on hyperparasitic Sphaeriales, Hypocreales and 'hypocreoid Dothideales'. Kew Bull. 331: 595-610.

Reynolds, D.R. 1982. Foliicolous Ascomycetes: 4. The capnodiaceous genus *Trichomerium* Spegazzini emend. Mycotaxon 14: 189-220.

Rossman, A.Y. 1987. The Tubeufiaceae and similar Loculoascomycetes. Mycol. Pap. 157: 1-71.

Roux, C., O. Bricaud, E. Sérusiaux and C. Coste. 1994. *Wentiomyces lichenicola* subsp. nov. *bouteillei* Champignon lichenicole non lichenie (Dothideales, Dimeriaceae). Mycotaxon 50: 459-474.

Scheuer, C. 1988. Ascomyceten auf Cyperaceen und Juncaceen im Ostalpenraum. Biblioth. Mycol. 123: 1-274.

Sivanesan, A. 1987. Studies on the genera *Dimeriellopsis*, *Hyalomeliolina* and *Nematostoma*. Syst. Ascomyc. 6: 201-212.

Spegazzini, C. 1908. Fungi aliquot Paulistani. Rev. Mus. de La Plata, 2, 15: 7-48.

Theissen, F. 1912. Zur Revision der Gattung *Dimerosporium*. Beih. Bot. Centralbl. 2 Abt., 29: 45-73.

_____ and H. Sydow. 1918. Vorentwurfe zu den Pseudosphaeriales. Ann. Mycol. 16: 1-34.

Toro, R.A. 1952. Study of the tropical American black-mildews. J. Agric. Univ. Puerto Rico 36: 24-87.

Untereiner, W.A., N.A. Straus, and D. Malloch. 1995. A molecular-morphotaxonomic approach to the systematics of the Herpotrichiellaceae and allied black yeasts. Mycol. Res. 99: 897-913.

MYCOTAXON

Volume LXIV, pp. 173-177 September 1997

THERRYA EUCALYPTI SP. NOV. ON STEMS OF EUCALYPTS FROM TASMANIA, AUSTRALIA

ZI QING YUAN[AB] and C. MOHAMMED[AB]

[A] Department of Agricultural Science, University of Tasmania, GPO Box 252-54, Hobart, Tas. 7001, Australia.

[B] CSIRO Forestry and Forest Products, Tasmanian Research Centre, GPO Box 252-12, Hobart, Tas. 7001, Australia.

SUMMARY

Therrya eucalypti sp. nov. on stems of *Eucalyptus regnans* is described and illustrated. The fungus is distinguished from other known species of the genus *Therrya* by its cylindrical asci and long, fusiform, septate ascospores. The differences between *T. eucalypti* and similar species are discussed. The main morphological features of all six species of the genus are compared.

INTRODUCTION

In a 4-year-old plantation of *Eucalyptus regnans* F. Muell. at Westfield, Tasmania, a discomyceteous fungus was collected on dead branches of lower crowns, mainly at the bases of the branches. Morphological features of this fungus fit the generic description of *Therrya* Sacc. given by Reid & Cain (1961). All known species of *Therrya* are found on conifers in Europe and North America and most of them are associated with stem cankers (Funk, 1980, 1981; Minter, 1994). The Australian fungus does not appear to be morphologically conspecific to any other *Therrya* species and is proposed as a new species. Its pathogenicity has not been tested.

Microscopic examination of specimens was carried out on squash mounts and thin median sections. The material was mounted in Shear's mounting fluid and lactophenol cotton blue. Fifty mature ascospores were measured and arithmetic means calculated.

The holotype is deposited in the Herbarium of the Institute for Horticultural Development, Knoxfield, Australia (VPRI).

DESCRIPTION

Therrya eucalypti Z.Q. Yuan, sp. nov. Figs. 1-5

Etymology: refers to the host of the fungus.

Ascostromata immersa ad erumpentia, sessilia, solitaria vel gregaria, orbicularia ad elongata vel irregularia, 1-1.3 x 1.2-1.8 mm, 0.5-0.7 mm alta, atra; excipulo atro, fissuris longitudinis vel fissuris radiatis, inaequalibus dehiscenti; subhymenio hyalino, plectenchymato; excipulo medullae 50-200 µm alto. Asci 150-195 x 8-10 µm, cylindrici, unitunicati (I^-), apice rotundati et leviter incrassati, sex- vel octospori. Ascosporae 62-88 x 2-3.0 µm, hyalinae, fusiformes, rectae vel curvae, 2-5-septatae. Paraphyses filiformes, ad apicem leviter incrassata et ramosa, agglutinatae, epithecium formante.

Holotypus in ramulis mortuis *Eucalypti regnans*, Westfield, Florentine Valley, Tasmania, 13 July 1995, *Z.Q. Yuan* 42 (VPRI 21091).

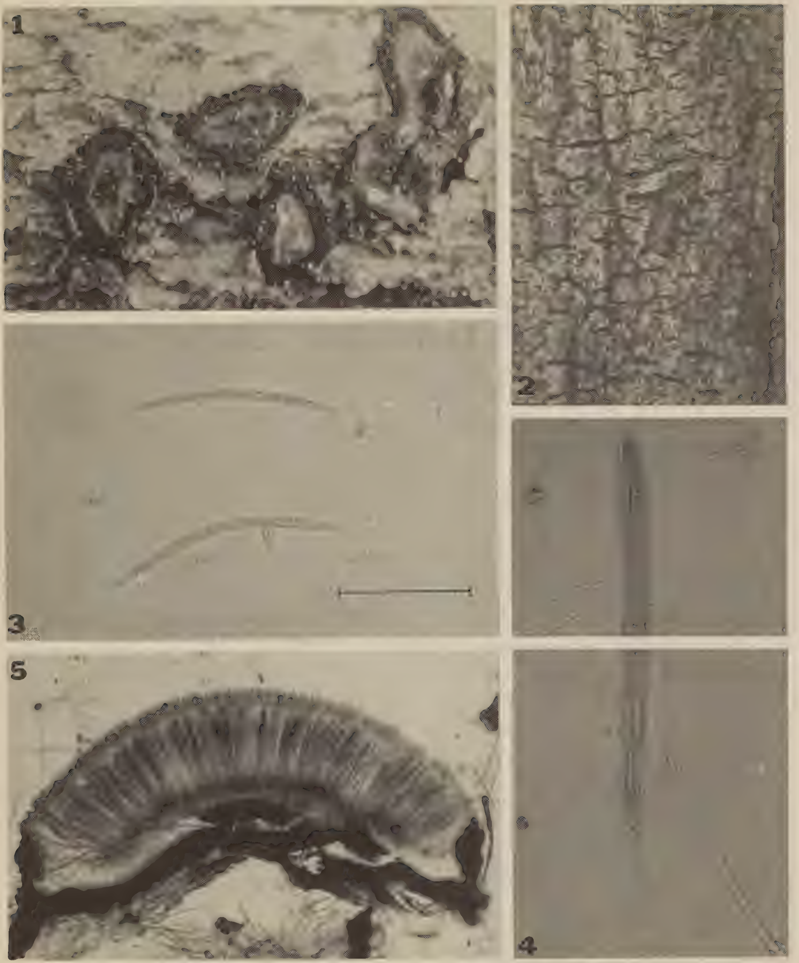
Ascostromata immersed to erumpent, sessile, solitary or 2-5 gregarious, round to elongate or irregular, 1-1.3 x 1.2-1.8 mm, 0.5-0.7 mm high; black; excipulum black, dehiscing by a single longitudinal split or splitting into unequal radiating fissures to expose the orange-colored hymenium; subhymenium hyaline, plectenchymatous; medullary excipulum 50-200 µm high. Asci 150-195 x 8-10 (mean 182 x 8.5) µm, unitunicate, cylindrical, rounded or blunt at apex, slightly thickened, apical ring not blue in iodine, 8-spored, occasionally 6-spored. Ascospores 62-88 x 2-3.0 (mean 78 x 2.6) µm, hyaline, fusiform, straight or curved, 2-5 septate, in two fascicles in the ascus. Paraphyses filiform, slightly swollen at the apex, branched and agglutinated above the asci to form epithecium.

On dead branches of *Eucalyptus regnans*.

Specimens examined: Tasmania, Florentine Valley, Westfield, on *Eucalyptus regnans*, 13 July 1995, *Z.Q. Yuan* 42 (VPRI 21091, Holotype); same location and host, 13 July 1995, *Z.Q. Yuan* 49; same location and host, 20 July 1995, *Z.Q. Yuan* 54; same location and host, 20 July 1995, *Z.Q. Yuan* 58.

DISCUSSION

The genus *Therrya* was originally established by Saccardo and Penzig (*Michelia* **2**, 604, 1882) for the type *T. pini* (Alb. & Schwein) Höhn. (as *T. gallica* Sacc. & Penz.). Reid & Cain (1961) simplified the concept of the genus and accepted two species, *T. pini* and *T. fuckelii* (Rehm) Kujala. Funk (1980) described three new species parasitic on western conifers in North America. Since then no more species have been added to this genus (Hawksworth *et al.*, 1995). The genus was included in the family Phacidiaceae based on the absence of a mucilaginous sheath surrounding fusoid ascospores (Korf, 1973). Phacidiaceae has been restricted by Di Cosmo *et al.* (1984) to only designate genera having asci with I^+ apical rings and hyaline, aseptate ascospores without sheaths. *Therrya* with I^- asci and septate ascospores has been included in the Rhytismataceae (Hawksworth *et al.*, 1995). Therefore, the discomyceteous fungus described in this paper, with immersed, sessile ascostromata, I^- asci and hyaline, fusiform and multiseptate ascospores without a mucilaginous sheath is best accommodated in the genus *Therrya*.



Figs. 1-5: *Therrya eucalypti*. **1**. Ascostromata (fully opening); **2** Ascostroma (half opening); **3** Ascospores with two and four septa; **4**. A single ascus containing eight spores ; **5**. Longitudinal section of an ascostroma (Sections in Figs. 3-5 were stained in lactophenol cotton blue). (Standard bar = 1.5 mm for Fig.1, 2.5 mm for Fig.2, 40 µm for Fig.3, 45 µm for Fig.4 and 300 µm for Fig.5)

Table 1. Morphological comparison of all the known species of the genus *Therrya* with *T. eucalypti*[a]

	T. pini	*T. fuckelii*	*T. piceae*	*T. pseudotsugae*	*T. tsugae*	*T. eucalypti*
Ascostroma	Scattered or clustered, oval, 1.5-3 mm wide; opening by longitudinal fissures or irregular lobes	Scattered or clustered, 3 mm diam.; opening irregularly by lobes or splitting longitudinally	Round or discoid, 0.6-1.1 mm diam., 0.6 mm high; opening by irregular radiating fissures	Round to undulating, 0.5-0.7 mm diam., 0.4 mm high; opening by unequal radiating fissures	Hysteriiform to irregular, 0.6 x 0.3 mm, 0.3 mm high; opening by a single longitudinal split	Round to irregular, 1-1.3 x 1.2-1.8 mm, 0.5-0.7 mm high; opening by a single longitudinal split or unequal fissures
Epithecium	Dark brown to black	Dark brown to black	Brown	Pale yellow	—	Orange
Ascus	Clavate, 90-135 x 12-16 µm; 8-spored	Clavate to cylindrical, 105-157 x 10-17 µm; 4-spored	Clavate, apex thickened, 80-150 x 10-12 µm; 8-spored	Clavate, apex thickened, 165-185 x 8-10 µm; 8-spored	Clavate, apex flattened, thickened, 150 x 12 µm; 8-spored	Cylindrical, apex slightly thickened, 150-195 x 8-10 µm; 6-8-spored
Ascospore	Needle-shaped, no appendages, 3-7-septate, 50-80 x 2.5-4.5 µm	Fusiform, with an apical and basal thread-like appendage, 7-11-septate, 64.5-110 x 3-5.5µm	Broadly fusiform to clavate, straight, 3-septate, 30-38 x 4-4.5 µm	Fusiform, straight, 3-6-septate, 48-72 x 2 µm	Fusiform, curved, pointed at both ends, 2-4-septate, 45-85 x 2 µm	Fusiform, curved, pointed at both ends, 2-5-septate, 62-88 x 2-3 µm
Paraphysis	Apex swollen, up to 6 µm	Apex swollen, up to 6 µm	Filiform, broadened at apex, branched	Filiform, slightly swollen at apex, branched	Filiform	Filiform, slightly swollen at apex, branched
Host plant	*Pinus* spp.	*Pinus* spp.	*Picea glauca*	*Pseudotsuga menziesii*	*Tsuga heterophylla*	*Eucalyptus regnans*
Distribution	Europe	Europe, N America	Canada	Canada	Canada	Australia

[a] Data for *T. pini* and *T. fuckelii* are from Reid & Cain (1961), for *T. piceae*, *T. pseudotsugae* and *T. tsugae* from Funk (1980).

The main characteristics of all the six species are compared in Table 1. The new species can be easily distinguished from other known species of the genus *Therrya* by typically cylindrical asci and long, fusiform, septate ascospores arranged in two fascicles in the ascus. The new species is closest to *T. tsugae* Funk in ascospore shape, size and septum number, but shape and size of both ascostromata and asci are different (Table 1). The ascostromata in the new species remain open to expose orange-colored hymenium after maturity, a feature similar to *T. pseudotsugae* Funk. In addition to the above mentioned morphological differences, the new species was found on a hardwood, *Eucalyptus regnans*, whereas all other species have been reported on conifers. This is also the first record of a *Therrya* species from the southern hemisphere.

ACKNOWLEDGMENTS

The authors are much obliged to Dr. M.E. Barr (Sidney, B. C., Canada) for reviewing the manuscript. The senior author wishes to thank the University of Tasmania and CSIRO Forestry and Forest Products for financial support, and North Forest Products for partial financial assistance.

REFERENCES

Di Cosmo F., Nag Raj, T.R. and Kendrick, W.B. (1984) A revision of the Phacideaceae and related anamorphs. *Mycotaxon* **21**: 1-234.

Funk, A. (1980). New *Therrya* species parasitic on western conifers. *Canadian Journal of Botany* **58**: 1291-1294.

Funk, A. (1981). *Parasitic microfungi of western trees*. Canadian Forestry Service, Pacific Forest Research Centre, Victoria, B. C.

Hawksworth, D.L., Kirk, P.M., Sutton, B.C. and Pegler, D.N. (1995). *Ainsworth and Bisby's Dictionary of the Fungi* (8th ed.). CAB International, Egham, Surrey. England.

Korf, R.P. (1973). Discomycetes and Tuberales. In *The Fungi*. Vol. IVA (ed. G.C. Ainsworth, F.S. Sparrow & A.S. Sussman), pp. 249-319. Academic Press, New York, NY.

Minter, D.W. (1994). The Rhytismatales on conifers from Europe. In *Shoot and Foliar Diseases in Forest Trees* (ed. P. Capretti, U. Heiniger & R. Stephan), pp. 65-84.

Reid, J. and Cain, R.F. (1961). The genus *Therrya*. *Canadian Journal of Botany* **39**: 1117-1129.

MYCOTAXON

Volume LXIV, pp. 179-188 September 1997

ENDOGONALES IN TAIWAN: A NEW GENUS WITH UNIZYGOSPORIC SPOROCARPS AND A HYPHAL MANTLE

CHI-GUANG WU and SUH-JEN LIN

Soil Microbiology Lab, Agricultural Chemistry Department,
Taiwan Agricultural Research Institute, Wu-feng, Taichung,
Taiwan, Republic of China

KEY WORDS: Endogonales, *Peridiospora*, flora, taxonomy.

ABSTRACT

A new genus, *Peridiospora*, in the Endogonaceae was first extracted from the mountain area of National Yu-shan Park, Central Taiwan mostly associated with *Pieris taiwanensis*. *Peridiospora* is characterized by producing only one zygospore in a zygosporocarp which is enclosed in a hyphal mantle. The genus accomodates two species, namely, *P. tatachia,* and *P. reticulata*. This is the first record of Endogonales in Taiwan. Keys to the genera in Endogonaceae and to the species of *Peridiospora* are provided.

Members of Endogonales, recently revised by Morton and Benny (1990) have not been found before in Taiwan. The order initially accomodated only one genus, *Endogone*, whose members are saprobic (Gerdemann and Trappe, 1974) or formed putative ectomycorrhizal associations (Chu-chou and Grace, 1979; Fassi et al., 1969; Walker, 1985). Recently, Warcup (1990) reported a new genus, *Sclerogone*, which differed from known species of *Endogone* in producing small, hard, sclerotioid sporocarps. Yao et al. (1995) erected another genus, *Youngiomyces*, in which single gametangia contact the zygospore in two or three separated places. Both genera form ectomycorrhizae or are probably saprobic.

Endogone, *Sclerogone*, and *Youngiomyces* produce multizygosporic sporocarps. In this paper, a fourth genus of Endogonales, *Peridiospora* is proposed that forms sporocarps with a single zygospore.

MATERIALS AND METHODS

Zygosporocarps of an endogonaceous fungus were recently found during an extensive investigation of mycorrhizal fungi in Taiwan natural reservation areas by wet-sieving and decanting (Gerdemann and Nicolson, 1963). The sievings were further purified by sucrose centrifugation (Daniels and Skipper, 1982). Zygosporocarps were mounted in PVLG (polyvinyl alcohol-lactic acid-glycerol) (Koske and Tessier, 1983; Omar et al., 1979) or Hoyer's medium (Cunningham, 1972) and made into semipermanent slides.

Holotype specimens are deposited in the Mycological Herbarium, Botany Department, National Taiwan University, Taipei, Taiwan, R.O.C. (TAI) and isotypes in the Mycological Herbarium, Department of Plant Pathology, University of Florida, Gainesville, Florida, U. S. A. (FLAS).

GENUS DESCRIPTION

PERIDIOSPORA Wu et Lin, *gen. nov.*

Zygosporae singulae vel aggregatae in solo vel on radicibus. Sporae a palla laxe adhaerente e hyphis, crasse tunicatis intertextis includae. Gametangia ephemera, aequa vel subaequa, ad vel prope apices coeuntia, zygosporam ad vel prope juncturam vel ex gametangio altero producentia. Species typica: Peridiospora pieris Wu & Lin.

Zygosporocarps produced singly or in aggregates in soil or on roots. Zygosporocarps contain one zygosporangium. Zygosporangia enclosed by a hyphal peridium. Gametangia ephemeral, uniting at or near their tips with the zygosporangium budding the point of union or from one of the two gametangia. Type species: *Peridiospora tatachia* Wu & Lin.

ETYMOLOGY: Latin, *peridio-* (peridial) and *-spora* (spore): a spore enclosed by hyphal peridium.

Peridiospora differs from *Endogone*, *Sclerogone* and *Youngiomyces* in the production of a colored, unisporic zygosporocarp, which is enclosed by a hyphal mantle. In general, the zygosporocarp is smaller than in the other three genera because it includes only one zygosporangium (Table 1).

Table 1. Comparison of taxa in the Endogonaceae

Character / Taxa	Size of Sporocarp	Wall of Sporangiothecium	Wall of Eusporangium
Endogone	1-25 mm broad	1-14 µm	1-10 µm
Peridiospora	±0.2 mm	±2 µm	±1 µm
Sclerogone	±0.5 mm	±1 µm	±1-3 µm
Youngiomyces	2.5 X 11 mm	2.5-5 µm	5-8 µm

Zygosporangia of *Peridiospora* are similar to those of some species of *Mortierella*. Both have a thin, nearly hyaline zygosporangium invested by a hyphal mantle. However, zygospore formation is different in both genera. In *Mortierella*, the two gametangia attach separately and are segregated from the zygospore by two septa (Gams et al., 1972; Kuhlman 1972; Chien et al., 1974). In *Peridiospora*, the zygosporangium buds out of the top of one of the gametangia, as in *Endogone*.

Key to the species of *Peridiospora*

A. Zygosporangial wall smooth.................................*P. tatachia*
AA. Zygosporangial wall reticulate and pitted............*P. reticulata*

SPECIES DESCRIPTIONS

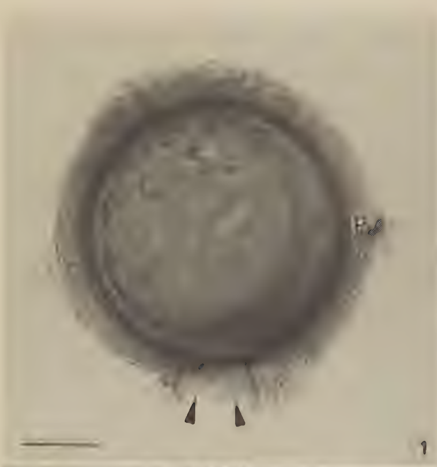
PERIDIOSPORA TATACHIA Wu et Lin, *sp. nov.* Figs. 1-4

Zygosporae flavae vel rufobrunneae, cum tunica hypharum intertextarum 2.5-12.5 µm diam, adpressarum ad spora, usque ad 15 *µm crassa. Zygosporae singulae vel aggregatae in solo, vel on radicibus. Gametangia tenuiter tunicata, ephemera, ad apices coeuntia, zygosporam super juncturam producentia. Zygosporae globosae, subglobosae, vel obovoideae 110-135* x *110-185 µm (cum tunica hypharum). Tunicae sporarum stratis duobus, separabilibus: exteriore 2 µm crasso, brunneo; interiore ca. 1 µm crasso, membranaceo. Typus: Wu-831020 (TAI).*

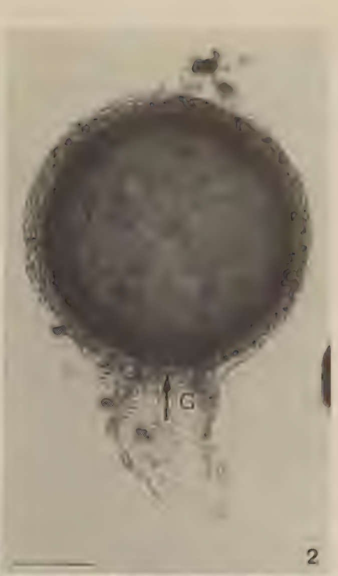
Zygosporocarps borne singly or in aggregates in the soil or on roots, containing a zygosporangium separately. Zygosporangia yellow brown or reddish brown, with a mantle of pale yellow, interwoven hyhae appressed to the sporangiothecium, 2.5-12.5 µm diam. forming layers of hyphae up to 15 µm thick. Gametangia thin-walled and ephemeral, uniting at their tips, with the zygosporagnium forming above the point of union. Zygosporangia globose, subglobose, or obovoid 110-135 x 110-185 µm (including hyphal mantle). Zygosporangium consisting of two walls. Wall 1, a unit wall, 2 µm thick, smooth and brown; wall 2, a membranous wall, ca.1 µm thick, hyaline. Peridial hyphae and outer spore wall stained pinkish brown and reddish brown respectively in Melzer's reagent. Holotype: Wu-831020 (TAI).

COLLECTIONS EXAMINED: TAIWAN: Nan-Tou, National Yu-san Park. HOLOTYPE: From the rhizosphere of *Pieris taiwanensis* Hayata, Wu-831020 (TAI); ISOTYPE: FLAS-F56217. PARATYPE: From the rhizosphere of the same host, Wu-831123 (TAI). From the rhizosphere of *Senecio nemorensis* L., Wu-831117 (TAI).

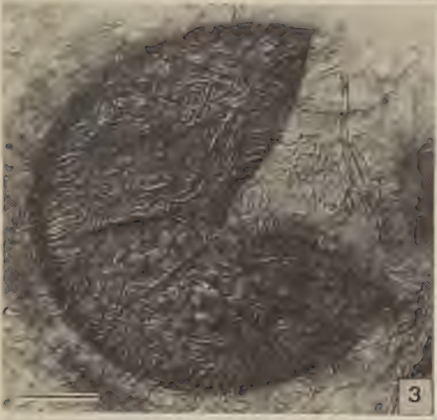
Figures 1-4. Micrographs of *Peridiospora tatachia*. Fig. 1. A unispored zygosporocarp enclosed by hyphal peridium (P). Note two gametangia (arrowheads) closely associated (scale bar=40 µm). Fig. 2. Gametangia (G) enveloped by hyphal mantle. Note an opening (arrow) between zygospore and gametangia (scale bar=40 µm). Fig. 3. Interwoven peridial hyphae (scale bar= 40 µm). Fig. 4. A zygospore with two wall layers (arrows) enclosed by hyphal peridium (P). Note the opening between gametangia (G) and zygospore (scale bar=40 µm). Figures 5-6. Micrographs of *Peridiospora reticulata*. Fig. 5. Two unispored zygosporocarps enclosed by hyphal peridia (P) (scale bar= 80 µm). Fig. 6. Close up of interwoven peridial hyphae (scale bar= 20 µm).



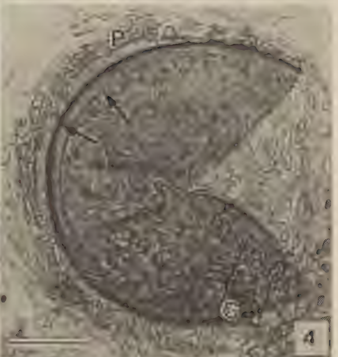
1



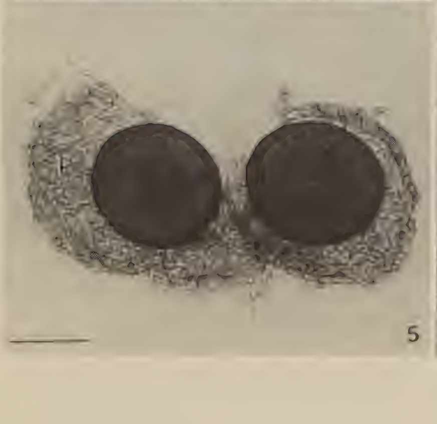
2



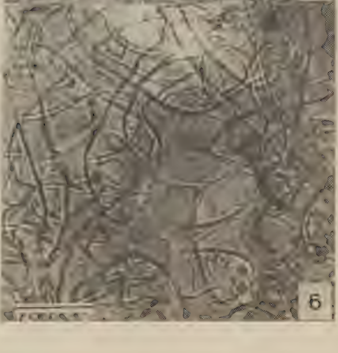
3



4



5



6

HABITAT: Hypogeous. Zygospores were isolated from Tatachia Saddle area, in National Yu-shan Park. The zygospores of *Peridiospora pieris* were isolated together with the spores of *Acaulospora sp.* (SM-83111701).

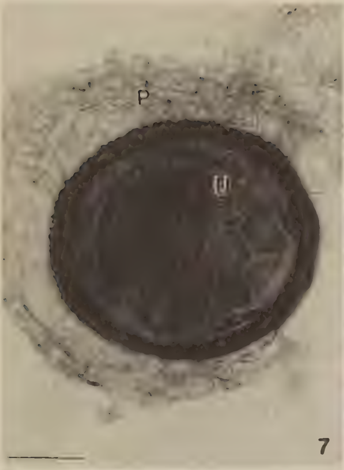
ETYMOLOGY: Latin, *tatachia* refers to the type locality where the zygosporangia of *P. tatachia* were first recovered.

NOTES: Zygosporangia of *Peridiospora tatachia* are similar to those of *Endogone lactiflua*. Both species produce yellow brown to orange brown zygosporangium of similar size (110-135 x 110-185 µm *vs.* 71-180 x 94-190 µm). However, the latter produces larger multispored zygosporocarps 1.5-5 mm diam (Gerdemann and Trappe, 1974). Additionally, the zygosporangial walls of *P. tatachia* are much thinner than those of *E. lactiflua* (±3 *vs.* 5-11 µm thick).

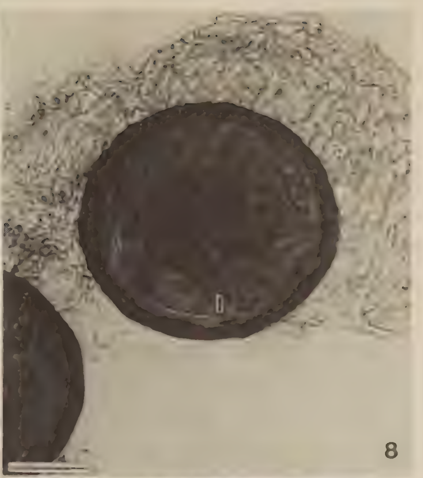
PERIDIOSPORA RETICULATA Wu et Lin, *sp. nov.* Figs. 5-10

Zygosporae flavae vel rufobrunneae, cum tunica hypharum intertextarum 5-17.5 µm diam, adpressarum ad spora, usque ad 40 µm crassa. Zygosporae singulae vel aggregatae in solo, vel on radicibus. Gametangia tenuiter tunicata, brunnea, ephemera, ad apices coeuntia, zygosporam super juncturam producentia. Zygosporae globosae, subglobosae, 140-200 µm diam (cum tunica hypharum). Tunicae sporarum stratis duobus, separabilibus: exteriore 1 µm crasso, brunneo, reticulato et scrobiculato; interiore <1 µm crasso, membranaceo. Typus: Wu-83120101 (TAI).

Figures 7-10. Micrographs of *Peridiospora reticulata*. Fig. 7. A mature spore enclosed by hyphal peridium (P). Note the polygonal reticulum structure and an opening of gametangial union (U) on spore surface (scale bar= 40 µm). Fig. 8. A continuous inner wall (I) of a zygospore (scale bar= 40 µm). Fig. 9. A zygospore enclosed by hyphal peridium showing two gametangia (G) (scale bar= 40 µm). Figures 10. Close up of spore wall with polygonal reticula, showing reticulate and minutely pitted feature (scale bar= 20 µm).

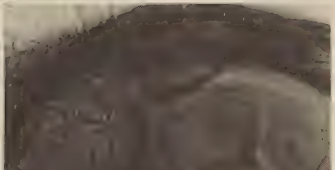


7



8

9



10

Zygosporocarps borne singly in the soil and containing one zygosporangium. Zygosporangia brown or reddish brown, with a mantle of hyaline, interwoven hyhae appressed to the sporangiothecium, 5-17.5 µm diam, forming layers of hyphae up to 40 µm thick. Gametangia thin-walled, brown and ephemeral, uniting at their tips with the zygosporangium forming above the point of union. Zygosporangia globose, or subglobose, 140-200 µm diam. (including hyphal mantle). Zygosporagnium consisting of two walls. Wall 1, a unit wall, reticulate and minutely pitted, 1 µm thick; wall 2, a membranous wall, <1 µm thick. No-reaction to Melzer's reagent. Holotype: Wu-83120101(TAI).

COLLECTIONS EXAMINED: TAIWAN: Nan-Tou, National Yu-san Park. HOLOTYPE: From the rhizosphere of native weed, Wu-83120101 (TAI). ISOTYPE: FLAS-F56216. PARATYPE: From the rhizosphere of *Pieris taiwanensis* Hayata, Wu-83120102 (TAI).

HABITAT: Hypogeous. Spores were isolated from Tatachia Saddle area, in the National Yu-shan Park. The zygospores of *Peridiospora undulata* were isolated together with the spores of *Acaulospora sp.* (SM-83111701), and *Sclerocystis rubiformis* Gerd. & Trappe.

ETYMOLOGY: Latin, *reticulata* (reticulate), refers to the spore ornamentation.

NOTES: The reticulate and minutely pitted outer spore wall is the major characteristic that segregates *P. reticulata* from *P. tatachia*. The latter produces a yellow brown zygosporangium with smooth outer wall.

Key to the genera of Endogonaceae

1. Sporocarps with multiple zygospores; zygospores hyaline or variously colored, peridial hyphae present or absent....................2
1. Sporocarps with one zygospore; zygospores and attached gametangia colored, enclosed by loosely interwoven peridial hyphae..*Peridiospora*

2. Sporocarps <0.5 mm, brown, hard, not aggregated; zygospores hyaline, enclosed by compacted interwoven thick-walled hyphae..*Sclerogone*
2. Sporocarps mostly >0.5 mm, variously colored......................3
3. Zygosporangia with discrete gametangial elements attached to the sporangiothecium when a zygospore is developed....*Youngiomyces*
3. Zygosporangia developed from only one attaching site of paired gametagia and enclosed by or lacking a hyphal mantle.....*Endogone*

ACKNOWLEDGEMENTS

This research was financially supported by The National Science Council of Taiwan, Republic of China (NSC NSC 84-2321-B-055-001). Appreciation is extended to Drs. James M. Trappe, R. E. Koske, James W. Kimbrough, and G. L. Benny for their critical reviews of this manuscript. Gratitude is owed to Drs. Y. Dalpé and Michael Corlett, Mycology Herbarium, Canada Agriculture, Ottawa for their kind assistance in studying herbarial collections. We would also like to thank Ms. Shiou-Yue Chang and Jing-Wen Lin for their assistance in collecting soil samples and spore isolation.

REFERENCES

Chien, Chiu-Yuan, E. G. Kuhlman, and W. Gams. 1974. Zygospores in two *Mortierella* species with "stylospores". Mycologia 66:114-121.

Chu-Chou, M. and L. G. Grace. 1979. *Endogone flammicorona* as a mycorrhiza symbiont of Douglas fir in New Zealand. New Zealand J. For. Sci. 9:344-347.

Cunningham, J. L. 1972. A miracle mounting fluid for permanent whole-mounts of microfungi. Mycologia 64:906-911

Daniels, B. A. and H. D. Skipper. 1982. Methods for the recovery and quantitative estimation of propagules from soil. pp. 20-45. *In*: *Methods and principles of mycorrhizal research*, ed. by N. C. Schenck, The American Phytopathological Society, St. Paul, Minnesota.

Fassi, B., A. Fontana, and J. M. Trappe. 1969. Ectomycorrhizae formed by *Endogone lactiflua* with species of *Pinus* and *Pseudotsuga*. Mycologia 61:412-414.

Gams, W., Chiu-Yuan Chien, and K. H. Domsch. 1972. Zygospore formation by the heterthallic *Mortierella elongata* and a related homothallic species, *M. epigama* sp. nov. Trans. Br. Mycol. Soc. 58:5-13.

Gerdemann, J. W. and T. H. Nicolson. 1963. Spores of mycorrhizal *Endogone* species extracted from soil by wet-sieving and decanting. Trans. Br. Mycol. Soc. 46:235-244.

Gerdemann, J. W. and J. M. Trappe. 1974. Endogonaceae in the Pacific Northwest. Mycologia Mem. 5:1-76.

Koske, R. E. and B. Tessier. 1983. A convenient, permanent slide mounting medium. Newsletter Mycol. Soc. Amer. 34(2):59.

Kuhlman, E. G. 1972. Variation in zygospore formation among species of *Mortierella*. Mycologia 64:325-341.

Morton, J. B. and G. L. Benny. 1990. Revised classification of arbuscular mycorrhizal fungi (Zygomycetes): A new order, Glomales, two new suborders, Glomineae and Gigasporineae, and two new families, Acaulosporaceae and Gigasporaceae, with an amendation of Glomaceae. Mycotaxon 37:471-491.

Omar, M. B., L. Bolland, and W. A. Heather. 1979. A permanent mounting medium. Bull. Brit. Mycol. Soc. 13:31-32.

Walker, C. 1985. *Endogone lactiflua* forming ectomycorrhizas with *Pinus contorta*. Trans. Brit. Mycol. Soc. 84:353-355.

Warcup, J. H. 1990. Taxonomy, culture and mycorrhizal association of some zygosporic Endogonaceae. Mycol. Res. 94:173-178.

Yao, Y.-J., D. N. Pegler and T. W. K. Young. 1995. *Youngiomyces*, a new genus in Endogonales (Zygomycotina). Kew Bulletin 50:349-357.

MYCOTAXON

Volume LXIV, pp. 189-193 September 1997

NOTES ON CONIDIAL FUNGI. XV. *MONODICTYS BICOLORATA, SP. NOV.*

R. F. CASTAÑEDA RUÍZ,[1] J. GUARRO[2] AND M. J. FIGUERAS [2]

[1]Instituto de Investigaciones Fundamentales en Agricultura Tropical "Alejandro de Humboldt"(INIFAT) calle 1, esq. 2,Santiago de Las Vegas,C.Habana,Cuba.[2]Unitat de Microbiologia, Facultat de Medicina i Ciències de la Salut, Universitat Rovira i Virgili, 43201 Reus,Tarragona, Spain.

ABSTRACT

Monodictys bicolorata *anam. sp. nov.*, distinguished by subspherical to oblong , two-colored conidia, is described and illustrated. It was found on leaf litter in a rainforest from Cuba. Notes on similar species are provided.

Key words: ***Monodictys*, *Hermatomyces***, hyphomycetes, leaf litter, systematics, Cuba.

RESUMEN

Se describe e ilustra la nueva especie ***Monodictys bicolorata***, caracterizada por conidios de subesféricos a oblongos y bicoloreados. Fue aislada a partir de hojas caídas de un bosque tropical de Cuba. Se compara con otras especies parecidas.

Palabras claves: ***Monodictys*, *Hermatomyces***, hifomycetes, hojarasca, sistemática, Cuba.

TAXONOMY

Monodictys bicolorata Castañeda Ruíz et Guarro, *anam. sp. nov.*
Etymol: Latin *bicolorata*, two-colored, as applies to conidia.

Ad fungos conidiales, hyphomycetes pertinens. Coloniae in substrato naturali effusae, punctiformes, hypophyllae, nigrae. Mycelium partim superficiale et partim in substrato immersum. Hyphae septatae, laeves, ramosae, hyalinae, 1.5-2.0 μm diam. Conidiophora inconspicua (interdum in cellula conidiogena reducta), mononematosa, cylindrica, breviter ramosae, hyalina, laevia. Cellulae conidiogenae monoblasticae, determinatae, cylindricae interdum inflatae, 5-15 x 1.5-2.5 μm, laeves, hyalinae. Conidia subsphaerica usque oblonga, muriformia, solitaria, sicca, crenulata, 15-25 x 10-19 μm, bicolorata, ex 4-8-cellulis *centralibus atrobrunneis vel nigris et cellulis marginalibus dilute brunneis vel subhyalinis composita. Teleomorphosis ignota.*

Substratum: In foliis dejectis non determinatae, Los Palacios, Holguín, Cuba. Leg. R.F. Castañeda Ruíz, 4-XII-1995.
Holotypus. INIFAT C96/32, Santiago de las Vegas, Ciudad de la Habana, Cuba.
Isotypus: MUCL 39883

Conidial fungi, hyphomycetes. Colonies on natural substrate effuse, punctiform, hypophyllous, black. Mycelium both superficial and immersed. Hyphae septate, smooth-walled, branched, hyaline, 1.5-2.0 μm diam. Conidiophores micronematous, inconspicuous (short side- branches of assimilative hyphae often reduced to conidiogenous cells), mononematous, cylindrical, hyaline, smooth. Conidiogenous cells monoblastic, determinate, termminal or lateral, sometimes proliferating sympodially, cylindrical, sometimes inflated just below the conidium, 5-15 x 1.5-2.5 μm, smooth, hyaline. Conidia subspherical to oblong, or quadrate muriform, solitary, dry, crenulate, 15-25 (35) x 10-19 μm, two-colored, laterally flattened 4-8 central cells dark brown to black and marginal cells, very variable in number, subhyaline to very pale brown. Teleomorph unknown.

Colonies on oat-meal agar at 25ºC reaching 26-30 μm diam in ten days, floccose, grey, reverse colourless. Conidiophores semimacronematous macronomatous, mononematous, cylindrical, septate, 28-35 x 2-3 μm, smooth, hyaline. Conidiogenous cells monoblastic, inflated, 6-10 x 3.5-5 μm, smooth, hyaline. Conidia subspherical to oblong, similar to those on the natural substrate, 15-25 x 10-12 μm.

Substrate: On rotten leaves of unidentified plant, Los Palacios, Holguín, Cuba. Col. R.F. Castañeda Ruíz. 4-XII-1995.
Holotype: INIFAT C96/32, Santiago de Las Vegas, Ciudad de la Habana, Cuba.
Isotype: MUCL 39883
Cultures deposited: INIFAT C96/32 = MUCL39883.

Among previously described species of *Monodictys* S.J. Hughes (Ellis 1971, 1976; Matsushima 1971, 1975, 1987, 1993; Schoknecht and Crane 1983; Castañeda Ruiz 1985 (Singh and Barde, 1985); Rao and de Hoog 1986; Mel'nik 1988; Castañeda Ruiz and Kendrick 1990; Mercado *et al.* 1995) ***M. bicolorata*** shows only superficial similarities to ***M. gemmipara*** Rao & de Hoog (1986). However, the conidia of the latter are bigger (50- 70 x 45- 50 μm diam.) and from their peripheral cells arise secondary conidia (12- 14 μm diam.). Also, ***Hermatomyces dimorphus*** Rao & de Hoog (1986) bears some resemblance to ***Monodictys bicolorata*** in conidial morphology, but the former has brown, verrucose or irregularly ornamented hyphae, the conidia (35-55 μm diam. and 15-20 μm thick) are lenticular, and oriented perpendicularly to the conidiogenous cells.

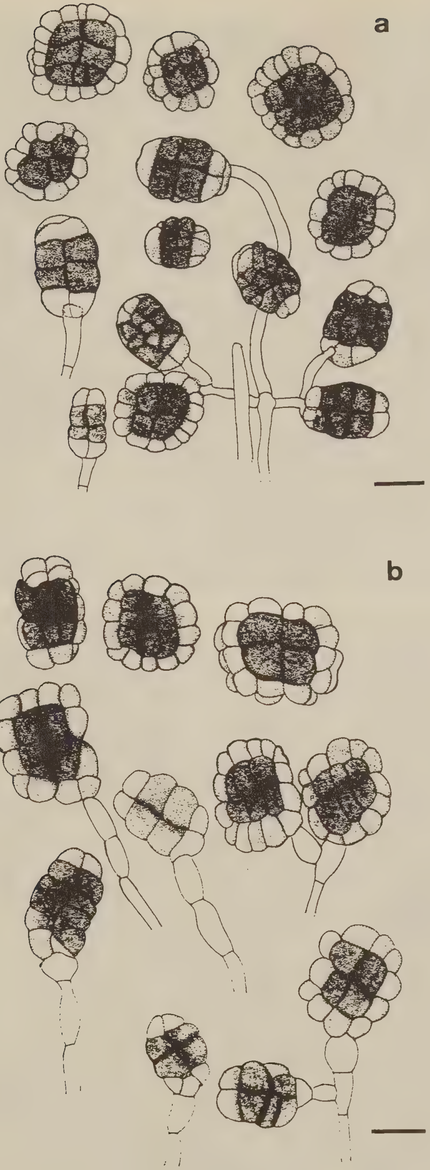


Fig. 1.- *Monodictys bicolorata* (INIFAT C96/32). a, on natural substrate; b, on oat-meal agar. Bar = 10µm.

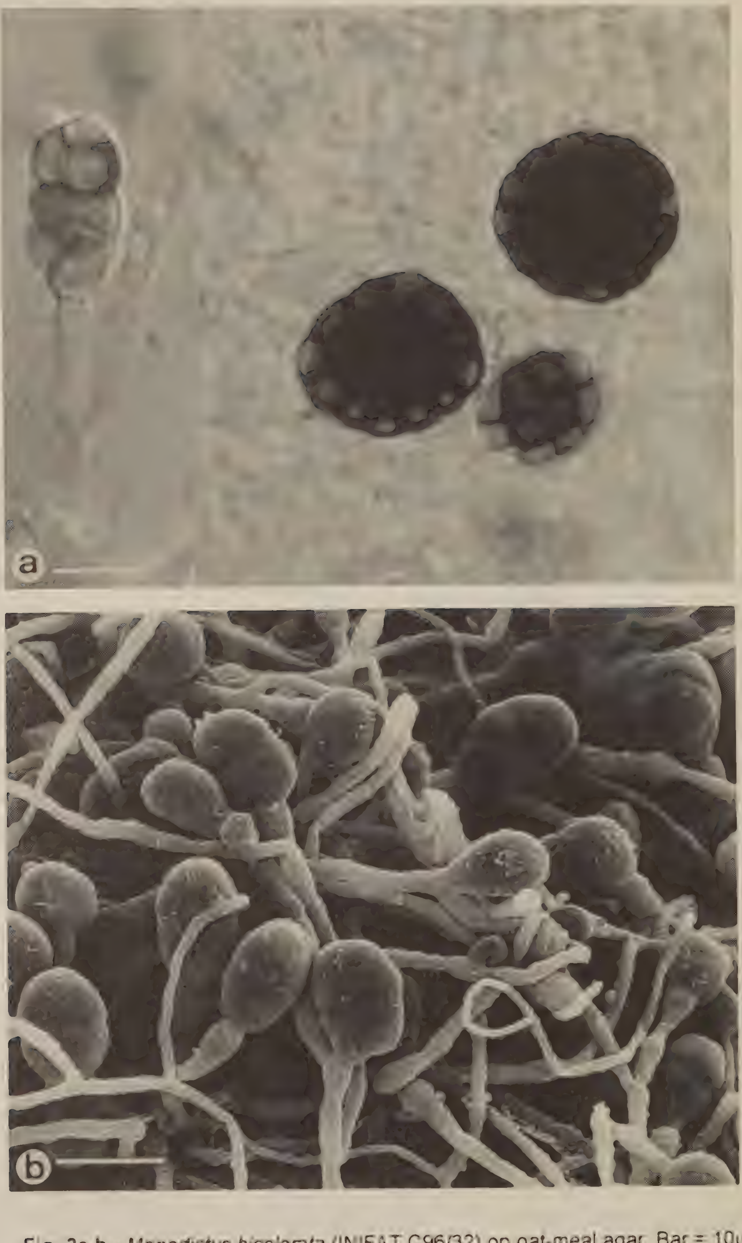


Fig. 2a,b.- *Monodictys bicolorata* (INIFAT C96/32) on oat-meal agar. Bar = 10µm.

ACKNOWLEDGEMENTS

We are indebted to Dr. E. Descals (Institut d'Estudis Avançats, UIB-CSIC, Palma de Mallorca) for kindly reviewing the manuscript and the Cuban Ministry of Agriculture for facilities.

REFERENCES

CASTAÑEDA RUIZ, R.F. 1985. Deuteromycotina de Cuba. Hyphomycetes III. Instituto de Investigaciones Fundamentales en Agricultura Tropical "Alejandro de Humboldt", Habana, 42 pp.

CASTAÑEDA RUIZ, R.F. and KENDRICK, B. 1990.: Conidial Fungi from Cuba I. *University of Waterloo Biology Series* **32**: 1-53.

ELLIS, M.B. 1971. Dematiaceous Hyphomycetes. Commonwealth Mycological Institute, Kew, 608 pp.

ELLIS, M.B. 1976. More Dematiaceous Hyphomycetes. Commonwealth Mycological Institute, Kew, 507 pp.

MATSUSHIMA, T. 1971. Microfungi of the Solomon Islands and Papua- New Guinea. T. Matsushima, Kobe, 78 pp.

MATSUSHIMA, T. 1975. Icones microfungorum a Matsushima lectorum. T. Matsushima, Kobe, 209 pp.

MATSUSHIMA, T. 1987. Matsushima Mycological Memoirs **5**: 1-100, T. Matsushima, Kobe.

MATSUSHIMA, T. 1993. Matsushima Mycological Memoirs **7:** 1-75, T. Matsushima, Kobe.

MEL'NIK, V. A. 1988. New species of Hyphomycetes and Coelomycetes from collections in the Altai mountains and Soviet Far East. *Mikologia i Fitopatologia* **22**: 492-500.

MERCADO SIERRA, A. , HEREDIA, G. and MENA PORTALES M. 1995. New species of dematiaceous hyphomycetes from Veracruz, Mexico. *Mycotaxon* **55**: 491-499.

RAO, V. and HOOG, G. S. de. 1986. New or critical hyphomycetes from India. *Studies in Mycology* **28**: 1-83.

SCHOKNECHT, J. D. and CRANE, J. L. 1983. Additional hyphomycetes from fresh-water swamps and hammocks. *Canadian Journal of Botany* **61**: 2243-2247.

SINGH, S. M. and BARDE, A. K. 1985. ***Monodictys indica*** sp. nov. as a saprophyte but transitory fungus on human skin. *Current Science* **54**: 1001-1003.

MYCOTAXON

Volume LXIV, pp. 195-202 September 1997

XYLARIA PSEUDOAPICULATA AND XYLARIA MONTAGNEI: TWO NEW TAXA FROM SOUTH BRAZIL

Maria Sirlei Hamme and Rosa Trinidad Guerrero

Departamento de Botânica
Universidade Federal do Rio Grande do Sul
Porto Alegre, Rio Grande do Sul, Brasil, 90049-060

ABSTRACT

Xylaria montagnei *stat. et nom. nov.* and ***X. pseudoapiculata*** *sp. nov.* are proposed. Fresh material from Rio Grande do Sul and Rick's collections (in PACA), were studied. Descriptions and comments on culture aspects using Nobles System are presented.

RESUMO

São propostos dois novos taxa: ***Xylaria montagnei*** *stat. et nom. nov.* e ***Xylaria pseudoapiculata*** *sp. nov.*. Além de material vivo, foram estudadas também as coletas de Rick (depositadas no Herbário PACA) pertencente ao gênero ***Xylaria*** para o Rio Grande do Sul, Brasil. São apresentadas descrições, observações sobre estudo de cultura e ilustrações.

Key words: ***Xylaria***; biosystematics; Brazil; culture.

Theissen (1909) and Rick (1935) both published treatments of the genus ***Xylaria*** Hill ex Schrank from Rio Grande do Sul, Brazil. There is still no world monograph available, but some important papers on Neotropical ***Xylaria*** have appeared in recent years (Rogers & al., 1987; San Martín & Rogers, 1989). Recently, the first author has completed a project (M.Sc.) on the genus from the state of Rio Grande do Sul (Hamme, 1993; Hamme & Guerrero, 1994). The material collected by Rick, deposited in PACA herbarium, was included in the revision. In this paper two species are treated in detail. The purpose of the cultural methodology was to present a means to identification of endophytic fungi.

METHODS

Cultures were obtained by streaking masses of ascospores onto agar medium. Colonies were incubated on Difco malt-agar in 9 cm diam Petri dishes at 25°C and under 24 h darkness. Cultural features were studied using the Nobles System (Nobles, 1965). Petri dishes were sealed with tape and opened after six weeks.

Extracellular phenoloxidases like laccase, tyrosinase and peroxidase were detected by the Bavendamm test that uses gallic and tannic acid environment (malt extract 15g; agar 20g; gallic or tannic acid 5g; purified water 1000 ml). Codes by Bettucci & Guerrero (1971), were used for interpreting the results. The guaiacol test was also used (guaiacol 15g; ethanol 95% 30ml), to detect laccase. The effects of extracellular phenoloxidases test were analyzed after 7 days.

Abbreviations: Culture colletion of Depto. Botânica, UFRGS = MIC. Herbaria abbreviations follow Index Herbariorum, 1981. An asterisk (*) denotes that a culture has been obtained and studied.

Xylaria montagnei *stat. et nom. nov.* Fig. 1, a Plate I a,c.

Holotype: Brazil, Rio Grande do Sul, São Leopoldo, 1906, *in lignis.* Theissen n. 25 ex. herb. Bresadola (S).

≡***Xylaria corniformis*** (Fries) Fries var. ***macrospora*** Bres. apud Theissen, Ann. Mycol, 6. p. 342, 1908.

Stromata flabellate often enlarged at the tips, solitary or gregarious, sometimes branched, fertile part somewhat rugose, 13-28.5 x 7.5-36 mm, surface dark brown to black, sometimes with fine cracks or brownish scales, fertile apices usually with undulated rim. Stipes 6-38 x 1-6 mm, concolorous with fertile part, smooth or furrowed. Stipes often arising from reddish to dark brown pannoses bases. Ostioles papillate. Perithecia immersed, 0.5-0.7 mm diam.

Asci 8-spored, 218-243.6 *u*m long, long stipitate, fertile part cylindrical, 93-118.8 *u*m long, apical ring 3.9-4.8 high x 2.9-4.5 *u*m broad. Ascospores 13-22 x 5-6.6 *u*m (av. 18.7 x 6 *u*m, n=50), brown, one-celled, ellipsoid-inequilateral to navicular, smooth, straight germ slit, ventral, 1/3 to 1/2 spore length.

SUBSTRATE: Decaying dicotyledonous plants.

CULTURE STUDY

ISOLATE: MIC 385 (=ICN 95928)

MACROSCOPIC CHARACTERISTICS: Quick growth; colony reaching 37 - 53 mm in diam. at the end of the first week; covered dish in 1-2 weeks. White aerial mycelium with flakes dispersed in the third week covering the whole dish. Submerged crustose mycelium around the fifth week becoming dark around the center. Submerged edges, almost regular with very little undulation. Odour present, not identified. Anamorphic structures not present. Very strong reaction (+++++) and no growth on gallic acid; strong (++++) with growth on tannic acid; and positive (+) on guaiacol.

MICROSCOPIC CHARACTERISTICS: Hyaline hyphae in the aerial mycelium, colored with phloxin, 1.6 - 7.2 *u*m in diam, narrow walls. Hyaline to brown hyphae in the crustose mycelium very much branched, interlocking and swelling; 1.2 - 7.4 *u*m in diam and generally with thick walls.

COLLECTIONS EXAMINED: BRAZIL, Rio Grande do Sul, Salvador do Sul, 27.IV.1990, Hamme 184 (ICN 95928)*, 187 (ICN 97512). São Leopoldo, Theissen 25 (S) ex. herb. Bresadola (holotype); Theissen 24 (S) ex. herb. Bresadola; 106 (S) ex. herb. Sydow 1906; 315 (S); all labelled as *X. **corniformis*** var. ***macrospora***. No data (ICN 97511).

COLLECTIONS OF *X. **corniformis*** EXAMINED: syntype of Sphaeria ***corniformis*** (E). BRAZIL, Rio Grande do Sul, Guaíba, 03.VIII.1990, Hamme 263 (ICN 95837), 264 (ICN 95836), 273 (ICN 95838)*. Parobé, 11.IV.1990, Hamme 120 (ICN 95839). São Leopoldo, Rick (PACA 19507), (PACA 19423) as *X. **tuberosa*** forma ***consociata*** Starb.; ibid, ipse (PACA 19401) as *X.* aberrans Rick; ibid, ipse (PACA 19412, 19495) as *X. **rhopaloides***; ibid, ipse (PACA 19507, 19470, 19535) as *X. **rhopaloides*** forma ***brevipes*** Starb.; ibid, ipse (PACA 19499) as *X. **rhopaloides*** var. ***brunnea*** Rick; ibid, ipse (PACA 19519) as *X. **scruposa***; ibid, Theissen (PACA 19546) as *X. **rhopaloides*** var. ***brevipes***.

COLLECTIONS OF *X. **holmbergii*** EXAMINED: ARGENTINA, Misiones, 1886 (1884?) Holmberg (LPS 3310 type). BRAZIL, Paraná, Ponta Grossa, V.1990, R. T. Guerrero (ICN 95623). Rio Grande do Sul, Esmeralda, Aracuri, 29.IX.1988, R. M. Silveira (ICN 95617). Pareci, 1941, Rick (PACA 19378) as ***violaceo-pannosa***; ibid 10.II.1942, Rick (PACA 19516) as ***corniformis*** Parobé, Fazenda Santa Cristina do Pinhal, 11.IV.1990, Hamme 116 (ICN 95618). Santa Maria, 23.IX.1990, Gilberto Coelho (ICN 95608)*. São Francisco de Paula, 25.V.1990, Demétrio L. Guadagnin (ICN 95614); Hamme 208 (ICN 95609)*, 211 (ICN 95610); Ibid, Veraneio Hampel, 25.V.1990, Hamme 209 (ICN 80994)*, 210 (ICN 95620)*, 212 (ICN 95619), 214 (ICN 95613), 215 (ICN 95612), 216 (ICN 95611). Ibid, ipse 09.XII.1990, Hamme 335 (ICN 95622), 339 (ICN 95603)*, 346 (ICN 95621), 348 (ICN 95625);Ibid, ipse 27.V.1991, Hamme 402 (ICN 95605)*, 403 (ICN 95615), 408 (ICN 95604)*. São Leopoldo, 1929, Braum (PACA 19509, 19524, 19576) det. by Rick as ***corniformis***; ibid 1929, Rick (PACA 19441, 19484, 19548); ibid 1930, Rick (PACA 19420); ibid 1933, Rick (PACA 19385); ibid, 1936, Rick (PACA 19581);ibid 1940, Rick (PACA 19567) all as ***corniformis***. Salvador do Sul, Colégio Santo Inácio, 26.IV.1991, Hamme 386 (ICN 95616). Turvo, II.1990, César Rodrigues (ICN 95624)*. no data (ICN 95606, 95607).

COLLECTIONS OF *X. **longipes*** EXAMINED: BRAZIL, Rio Grande do Sul, Salvador do Sul, 27.IV.1990, Hamme 182 (ICN 102341). GERMANY, Westfalen, Nitschke (B) ex. herb. Nitschke. Cappenberg, VI.1865, Nitschke (B). VIII.1866, Nitschke (B). Wollbeck, X.1866, Füisting (B). Rheingau, Fuckel (B) (All syntypes of *X. **longipes*** Nits.).

NOTES

Since the name ***X. macrospora*** is preoccupied (***X. macrospora*** Penz. & Sacc.) we have proposed a *nomen novum* for the taxon described above. Dennis (1956, 1958) and Rogers (1983), both considered ***X. corniformis*** var. ***macrospora*** a synonym of ***X. longipes*** Nits. The former author did not (or hardly) use germ slit morphology in his revision while the latter apparently didn't study material of ***X. corniformis*** var. ***macrospora***. ***X. longipes*** has a full spore length sigmoid germ slit (Fig. 1,c), while it is only 1/3-1/2 of the spore length in ***X. montagnei*** (Fig. 1,a). Rogers and San Martin (pers. com.) both accept this difference as being genuine. ***X. corniformis*** var. ***corniformis*** has much smaller spores (Fig. 1,c) with a different germ slit morphology (Laessoe, 1987; Hamme & Guerrero, 1994). ***Xylaria corniformis*** belongs to a complex of closely related species. We have recently shown (Hamme & Guerrero, 1994) that ***X. holmbergii*** Speg. should be considered a separate species and not treated as a synonym of ***X. corniformis***. ***Xylaria transiens*** Theiss. is a very similar fungus described as having ascospores 19-24 x 9-10 *u*m (Theissen, 1908 & 1909). Lassoe (pers. com.) has studied a supposed isotype (in S, ex. Bresadola) having spores 19.1-22.4 x 6.6-7.9 *u*m. Macroscopically the collections seem to be the same. Nevertheless ***X. montagnei***. has ascospores only up 6.6 *u*m diam. We have only examined a single collection of ***X. transiens*** (Nova Petropolis , 1907, Rick; PACA 19431). It matches ***X. cubensis*** (Mont) Fr. We can not conclude anything from our cultural study at present since material of ***X. transiens*** has not been cultured and compared.

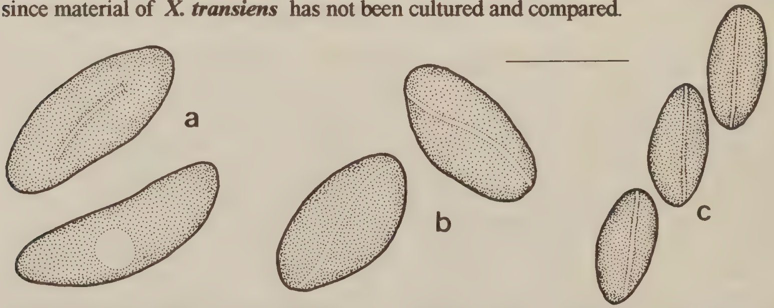


Fig. 1. a-c Ascospores: a, ***X. montagnei*** (ex. herb. Bres. 25 ,S). b, ***X. longipes*** (ex. herb. Nitschke , Westfalen, Coppenberg August 1866, B). c, ***X. corniformis*** (syntype E). Bar = 10 *u*m.

Xylaria pseudoapiculata *sp. nov.* Fig. 2, a Plate 1 b,d.

Holotype : Brazil, Rio Grande do Sul, Guaíba, 03.VIII.1990, on dicotyledonous twigs, Hamme 259 (ICN 95963).

Diagnosis: *Proxima est a* ***Xylaria apiculata*** Cooke, *tamen differt in fissura germinale spiralata.*

Stromata conical to long cylindric-conic, often gregarious simple or more rarely branched, fertile part more or less smooth, 15.5-19.5 x 2-5 mm, surface brown to black, with traces of juvenile cinnamon outer layer, apices sterile, mucronate, often becoming ribbon-like. Stipes long, 3.5-64.5 x 0.8-2 mm, typically dark brown, tomentose, bases usually more strigose hairy. Ostioles papillate, conical, inconspicuous. Perithecia spherical, immersed, 0.4-0.7 mm diam.

Asci 8-spored, 131-182 *u*m long, long-stipitate, fertile part cylindrical, 83-101 *u*m long, apical ring blue in Melzer's reagent, 3.5-4.5 *u*m high x 2.1-3 *u*m broad, inverted hat-shaped. Ascospores 14-20.9 X 4.9 -7.8 *u*m (av. 16.8 x 6 *u*m, n=50) medium brown, one-celled, inequilaterally ellipsoid, smooth, germ slit spiralling so that a part is always visible when spore rotate, full spore length, primary or secondary appendages not observed.

SUBSTRATE: Typically on dicotyledonous twigs in the litter layer.

DISTRIBUTION: South America

CULTURE STUDY

ISOLATES: MIC 372 (=ICN 95960); MIC 373 (=ICN 80995); MIC 374 (=ICN 95967); MIC 375 (=ICN 95962); MIC 376 (=ICN 95963); MIC 377 (=ICN 95966); MIC 378 (=ICN 95964).

MACROSCOPIC CHARACTERISTICS: Quick growth; colony reaching 35mm in diam, on average, at the end of the first week; covering dish in 2-3 weeks. White aerial mycelium, felty with branched silky submerged parts and almost transparent. Some parts of the aerial mycelium show farinaceous to floccose appearance between the second and third weeks. Submerged greenish carbon-like mycelium crust marking the felty parts in the third week; some dishes keep this up to the sixth week; others are covered (except the silky branches) with radial carbon-like crust, forming a dark and compact subsuperficial crustose cover. Regular edge. Odour present, not identified. Anamorphic structures not present. Strong reaction (++++) with growth in gallic and tannic acid; and positive (+) in guaiacol.

MICROSCOPIC CHARACTERISTICS: White hyphae in the aerial mycelium hyaline, colored with phloxin, 2 -3.5 *u*m in diam, usually with thin walls. Silky hyaline submerged hyphae, colored with phloxin, 1.9 - 5.1 *u*m in diam, with many drops, more or less thick walls. Brown hyphae in the crustose mycelium, very much branched and swelling; 2.5- 9.5 *u*m in diam, with thick walls.

COLLECTIONS EXAMINED: BRAZIL, Rio Grande do Sul, Barra do Ribeiro, 31.X.1990, on dead angiospermous twigs, Hamme 313 (ICN 95960)*. Esmeralda, 29.X.1988, R. M. Silveira (ICN 95958). Guaíba, 03.VIII.90, Hamme 256 (ICN 95961 ; ibid, ipse 257 (ICN 95962*); ibid ipse 258 (ICN 80995*); ibid, ipse 259 (ICN 95963*, holotype). Parobé, 11.IV.1990, ipse 121 (ICN 95964)*. Porto Alegre, 24.III.1990, ipse 091 (ICN 95966)*; 24.VIII.1991, ibid, ipse 424 (ICN 95967)*. Santa Maria do Herval, X.1991, R. W. Maluf (ICN 95959). São Francisco de Paula, 20.IV.1990, Hamme 153 (ICN 95965). São Leopoldo, 1936 , Rick (PACA 19409) as ***X. arbuscula***.;1907, ibid, ipse (PACA 19482); 1929, ibid, Braun (PACA 19421); 1932, ibid Rick (PACA 19381) all as ***X. apiculata*** Cooke.

COLLECTIONS OF ***X. apiculata*** EXAMINED: BRAZIL, Rio Grande do Sul, Barra do Ribeiro, 31.X.1990, on decayng wood, Hamme 305 (ICN 95825); Canela, XI.1992, R.T.Guerrero (ICN 95831); Parobé, 11.IV.1990, Hamme 123 (ICN 95823)*; Porto Alegre, 04.X.1992, Hamme 477 (ICN 95829), 478 (ICN 95830), 16.VIII.1992, Hamme 459 (ICN 95826),466 (ICN 95827), 01.XI.1992, Hamme 472 (ICN 95828); Salvador do Sul, 27.IV.1990, Hamme 183 (ICN 95824); São Francisco de Paula, 31.VIII.1992, Eunice Michel (ICN 95637); São Leopoldo, 1929, Braum (PACA 19502). NEW ZEALAND, Maungavoa 214, holotype of ***Xylaria apiculata*** (K).

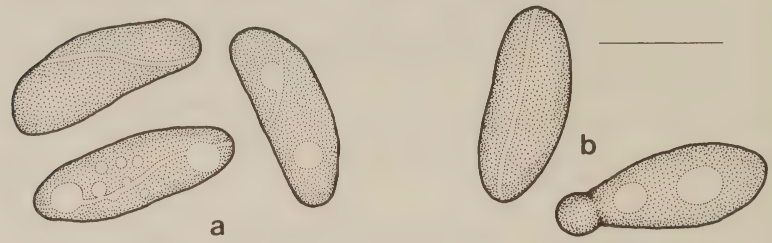


Fig.2. a-b Ascospores: a. ***X. pseudoapiculata*** (holotype, ICN). b. ***X. apiculata*** (holotype, K). Bar= 10 um..

NOTES:

Xylaria pseudoapiculata is clearly closely related to ***X. apiculata*** Cooke and presumably to the type of the genus ***X. hypoxylon*** (L.: Fr.) Grev. Those that have overlooked or ignored the sigmoid to spiralling germ slit have probably named material ***X. apiculata***. The type of ***X. apiculata*** has spores with a virtually straight, slightly less than full length or full length germ slit (fig. 2b). In any case Rick clearly acted in this way, since three of his ***X. apiculata*** collections in PACA showed the characteristic slit of ***X. pseudoapiculata.*** Rogers (1979) emphasized the importance of germ slit morphology by stating "in my experience the germ slit, when present, is a constant and diagnostic feature of many well circumscribed species". Although we have not observed any appendages on the ascospores of ***X. pseudoapiculata,*** it is likely we have overlooked them since Rogers (1979) listed ***X. apiculata*** as having spiralling slit and appendaged immature spores. Laessoe (pers. com.) has studied many collections from the Neotropics and elsewhere possessing a range of different germ slit morphologies. Further detailed studies, including molecular work, is clearly needed in order to elucidate the relationship in this very difficult complex. Material of ***X. apiculata*** and ***X. pseudoapiculata*** from Rio Grande do Sul differ in cultural characteristics. The latter reacts very strongly in the test for extracellular phenoloxidase, whereas the former reacts only slightly.

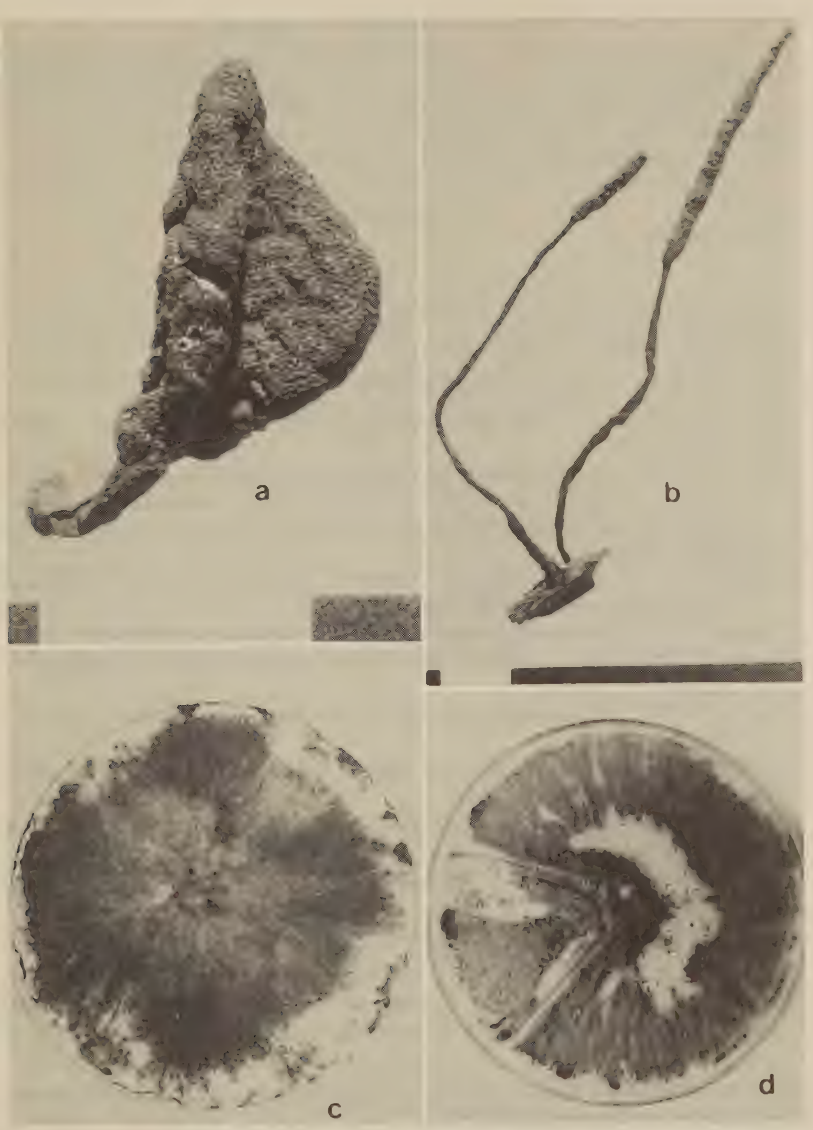


PLATE I. a-d. Stromata: a. ***X. montagnei*** (ICN 95928). b. ***X. pseudoapiculata*** (holotype). Cultures on MA: c. ***X. montagnei*** (MIC 385). d. ***X. pseudoapiculata*** (MIC 376). Bar = 1 cm.

ACKNOWLEDGMENTS

We are grateful to Dr. T. Laessoe (Copenhagen University) for the examination of the material sent by us and for his critical reading of the manuscript. We also thank Dr. J. D. Rogers and Dr. San Martin Gonzaléz for their helpful suggestions. We thank the curators of the following herbaria, B, E, K, PACA and S, for the loan of specimens. This work was supported by CAPES and FAPERGS grants.

LITERATURE

Bettucci, L. & R. T. Guerrero, 1971. Hongos xilófagos; estudio de cultivos. Bol. Fac. Agron. Montevideo, 118: 3-4.

Dennis, R.W.G. 1956. Some ***Xylarias*** of Tropical America. Kew Bull., 3:401-444.

Dennis, R.W.G. 1958. Some ***Xylosphaera*** of tropical Africa. Rev. Biol., Lisboa, 1(3-4):175-208.

Hamme, M. S. 1993. Contribuição ao estudo biossistemático de ***Xylaria*** Hill ex Schrank (Xylariaceae - Ascomycotina) para o Rio Grande do Sul, Brasil. Dissertação de Mestrado, Universidade Federal do Rio Grande do Sul, Porto Alegre, 106 pp.

Hamme, M. S. & R. T. Guerrero, 1994. Ocorrência de ***Xylaria holmbergii*** (Xylariaceae) no sul do Brasil. Napaea, 10:15-18.

Laessoe, T. 1987. ***Xylaria corniformis*** reconsidered. Mycotaxon, 30:81-85.

Laessoe, T.1993. ***Xylaria digitata*** and its allies - delimitation and typification-II. Persoonia 15 (2):1-42.

Martin, P. 1970. Studies in the Xylariaceae: VIII. ***Xylaria*** and its allies. Jl. S. Afr. Bot., 36(2):73-138.

Nobles, M. K. 1965. Identification of cultures of woodinhabiting Hymenomycetes. Can. J. Bot., 43:1097-1139.

Rick, J. 1935. Monographia das Xylariaceae riograndenses. Arch. Mus. Nac., Rio de Janeiro, 36:41-71. .

Rogers, J. D. 1979. The Xylariaceae: systematic, biological and evolutionary aspects. Mycologia, 71(1):1-42.

Rogers, J. D. 1983. ***Xylaria bulbosa***, ***Xylaria curta*** and ***Xylaria longipes*** in continental United States. Mycologia, 75(1-3):457-467.

Rogers, J. D., B. E. Callan, A. Y. Rossmam and G. J. Samuels. 1988. ***Xylaria*** (Sphaeriales, Xylariaceae) from cerro de la Neblina, Venezuela. Mycotaxon 31:103-153.

San Martín Gonzales, F. and J. D. Rogers. 1989. A preliminary account of ***Xylaria*** of Mexico. Mycotaxon 34:283-373.

Theissen, F. 1908. Novitates riograndenses. Ann. Mycol. 6:341-352.

Theissen, F. 1909. Xylariaceae Austro-brasilienses I: ***Xylaria***. Denkschr. K. Akad. Wiss. Wien, 83:47-86.

MYCOTAXON

Volume LXIV, pp. 203-223 September 1997

TROPICAL HYPHOMYCETES OF MEXICO. II. SOME SPECIES FROM THE TROPICAL BIOLOGY STATION "LOS TUXTLAS", VERACRUZ, MEXICO

Gabriela Heredia Abarca [2] , Julio Mena Portales [1]
Angel Mercado Sierra [1] and Manuela Reyes Estebanez [2]

[1] Instituto de Ecología y Sistemática, Ministerio de Ciencia, Tecnología y Medio Ambiente, La Habana Cuba.
[2] Instituto de Ecología , Apdo. Postal 63, Xalapa, Ver.
91000 México.

ABSTRACT

This contribution is the second in a series of papers dealing with the tropical hyphomycetes of Mexico. These fungi were found on plant litter collected from several areas of the Tropical Biology Station "Los Tuxtlas" in the state of Veracruz. Forty seven species are listed, of which 36 species are new records from Mexico. Substrates and distribution of the species are discussed.

Key words: Hyphomycetes, tropical fungi, Mexico,Veracruz.

INTRODUCTION

During surveys of microfungi associated with plant litter in some tropical areas of Mexico, numerous conidial fungi were found. The present contribution includes information of hyphomycetes collected on the Tropical Biology Station (TBS) "Los Tuxtlas". No previous account of hyphomycetes from this area have been published. The tropical biology station "Los Tuxtlas", belonging to the Instituto de Biología of the Universidad Nacional Autónoma de México is located at long. 95° 04′ to 95° 09′ W, lat. 18° 34′ to 18° 36′N, in the eastern part of the Sierra de Los Tuxtlas in the southern portion of the state of Veracruz (Lot-Helgueras, 1979) (Fig. 1). Elevation ranges from150 to 530 m. The station covers 640 ha, in which there are evergreen rain forest and secondary forest. Dominant arboreal species in the upper level of the forest (20-35 m) are *Nectandra ambigens* (Blake) Alle., *Brosimum alicastrum* Sw. and *Poulsenia armata* (Miq.) Standley, in the middle level (10-20 m) *Pseudolmedia oxyphyllaria* J. D. Smith and *Stemmadenia donnell-smithii* (Rose) Woodson and *Astrocaryum mexicanum* Liemb. Ex Mat. and *Faramea occidentalis* (L.) A. Rich. in the lower level (0-10 m). Additional details about the vegetation of the region can be found in Gómez-Pompa *et al*. (1979) and Gómez-Pompa & del Amo (1985).

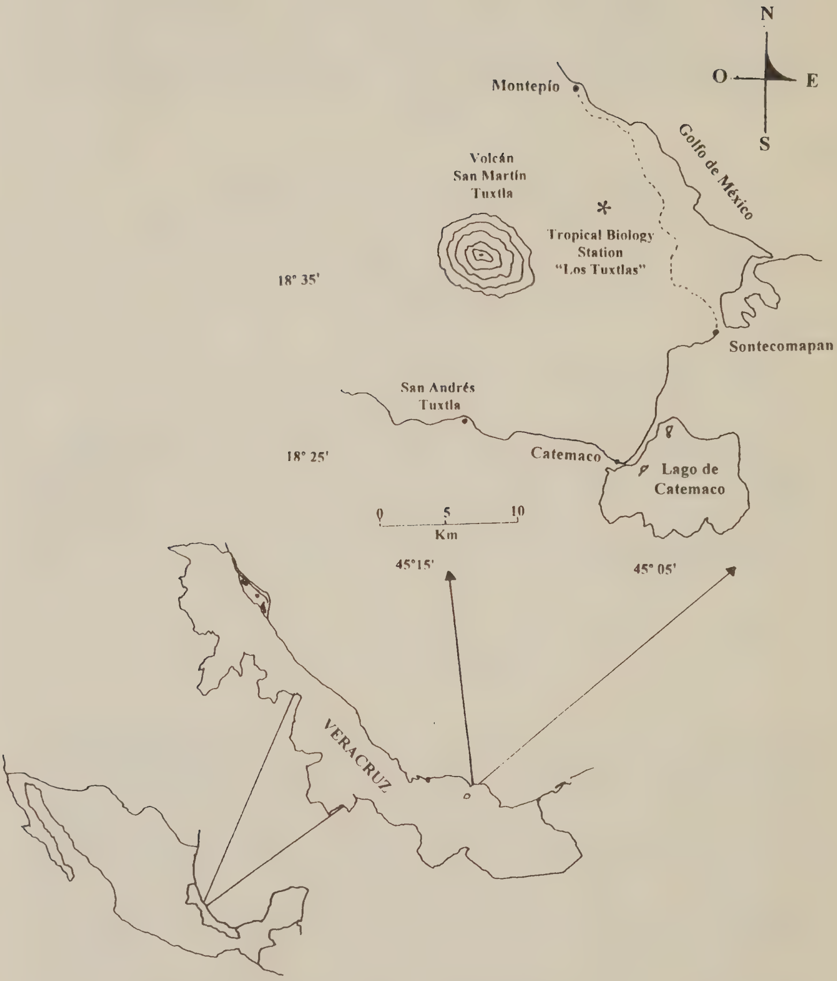

N
O
E
S
Montepío
Golfo de México
Volcán San Martín Tuxtla
Tropical Biology Station "Los Tuxtlas"
18° 35'
Sontecomapan
San Andrés Tuxtla
18° 25'
Catemaco
Lago de Catemaco
0
5
10
Km
45°15'
45° 05'
VERACRUZ

Fig. 1. Localization of the Tropical Biology Station "Los Tuxtlas".

The climate is hot and humid with a mean annual precipitation of 4953 mm and a mean temperature of 27° C. While rain occurs throughout the year, there is a "wet season" from June to February and a "dry season" from March to May. The driest month is usually March; the wettest month is usually October (Estrada, 1982).

METHODS

Plant litter was collected at several localities at the TBS "Los Tuxtlas". All the species were studied directly from natural substrate. Material was air dried for 12 h. Damp chambers were set up in the laboratory and incubated for 7-15 days at 28° C. Slides were mounted in lactophenol-cotton blue and polyvinyl alcohol. Specimens cited are by accession number, and are deposited at the herbarium of the Instituto de Ecología (XAL).

DESCRIPTION OF SPECIES

Acrodyctis elaeidicola M. B. Ellis, Mycol. Pap. 79:7-9, 1961.

Conidiophores simple, straight, dark brown to black, paler at the apex, smooth, septate, up to 180 µm long, 6-7 µm thick, tapering to 2-3 µm at the apex. **Conidiogenous cells** integrated, terminal, percurrent, 6-9 µm long, 2-3 µm wide. **Conidia** broadly clavate or pyriform, with longitudinal and transverse septa, brown to black, pale brown at the base, 19-23 µm long, 15-17 µm wide, 2-3 µm wide at the base.
Material examined. On dead rachides of palm. 23-XI-93, Rosas CB183-2.
Distribution. All the collections of this fungus are on decaying parts of palms. *A. elaeidicola* is known from Ghana, Sierra Leone (Ellis, 1961), Tanzania (Pirozynski, 1972) and Peru (Matsushima, 1993).

Acrodyctis globulosa (Toth) M. B. Ellis, Mycol. Pap. 103:34, 1965.

Conidiophores simple, pale brown, smooth, septate, up to 50 µm long, 4.5-5.0 µm wide. **Conidiogenous cells** integrated, terminal, percurrent. **Conidia** broadly ellipsoidal, subspherical or spherical, transversely and longitudinally septate, pale brown, smooth, 18-23 µm diam, basal cell cylindric protuberant, subhyaline, 3-6 µm wide.
Material examined. On dead branches. 22-XI-93, Mena CB115-2, Rosas CB121-2; 23-XI-93, Heredia CB160-2, CB169-1, Rosas CB187; 20-V-94, Rosas CB232-10.
Distribution. This species has been recorded from Hungary on *Clematis vitalba*, Sierra Leone on unidentified bark (Ellis, 1965), Solomon Islands on rotten *Musa paradisiaca* stem, (Matsushima, 1971), Canada on bark of *Alnus* and *Populus tremuloides* (Sutton, 1973), Japan on rotten petiole of *Arengae engleri* (Matsushima, 1975), Belize on dead wood (Morris, 1978), Cuba on unidentified dead branches

(Mercado-Sierra, 1982; Mena-Portales & Mercado-Sierra, 1987b), and on dead branches of *Licaria jamaiciensis, Fischeria havanensis, Amphelocera cubensis, Zanthaxylum* sp, *Coffea* sp and leaf litter (Mercado-Sierra & Mena-Portales, 1986), Pacific Islands on rotten bamboo stems and on dead *Leucaena glauca* seed pods (Matsushima, 1983) and from Peru on decaying palm petioles (Matsushima, 1993).

Acrodyctis queenslandica Matsushima, Matsushima Mycological Memoirs No. 6. Pag. 4, 1989.

Conidiophores simple, solitary or in small groups, straight, septate, dark brown, smooth, up to 265 µm long, 8-10 µm wide, 3.5-4 µm at the apex. **Conidia** muriform, transverse ellipsoidal, dark brown, 24-27 x 15-19 µm, basal cell pale brown, 3.5-4 µm wide.
Material examined. On dead branches. 10-XI-93, Mena CB098; 19-V-94, Mercado CB214-3; Rosas CB215; 23-XI-93, Mena CB157.
Observations. Conidiophores in our material are longer and wider than the type species; however the dimensions and morphology of the conidia, as well as other characteristics, match with Matsushima's description.
Distribution. Records of this fungus are scarce. It is known from Australia on dead bark of *Flagellariae indicae* (Matsushima, 1989) and from Peru, on decaying palm petioles and on a twig (Matsushima, 1993).

Arthrinium phaeospermum (Corda) M. B. Ellis, Mycol. Pap. 103:8-10, 1965.

Colonies pulvinate, widely effused, spore masses shiny, black. **Conidiophores** erect, cylindrical, pale brown, smooth, septate, up to 50 µm long, 2-2.5 µm thick. **Conidia** lenticular, dark brown, smooth, with a hyaline band, 9-12 µm diam. In face view, 5-7 µm thick.
Material examined. On fallen twigs. 19-V-94, Mercado CB229.
Distribution. This is a cosmopolitan species, very common on bamboos and many other substrates (Ellis, 1971). It has been recorded from Canada on decaying stalks of *Zea mays* and on *Typha latifolia* (Sutton, 1973), from the U.S.A. on inflorescence and leaves of *Spartina alterniflora* (Gessner & Goos, 1973), from Japan on *Perillae frutescentis* var. *crispae* (Matsushima, 1975), on *Phyllostachys* sp. and on *P. makinoi* stems (Matsushima, 1980) and from Peru on decaying palm-petioles (Matsushima, 1993).

Circinotrichum papakurae Hughes & Pirozynski, N. Z. J. Bot. 9: 40-42, 1970.

Setae simple, erect, straight, smooth, septate, dark brown near the base paler above, up to 40 µm high, 3-4 µm wide at the base. **Conidiogenous cells** obclavate, subhyaline, 7-9 µm long, 4-5 µm wide at the base. **Conidia** fusiform, hyaline, 12-17 x 1.5-2 µm.

Material examined. On fallen decaying leaves. 22-XI-93, Rosas CB114-3, Rosas CB126-2; 23-XI-93, Rosas CB141-3.
Distribution. This species is commonly found on tropical leaf litter. It has been recorded from New Zealand on unidentified leaves (Hughes & Pirozyski, 1971), fallen leaves of *Corynocarpus laevigatus* (McKenzie, 1991), *Melicytus ramiflorus* (McKenzie, 1992) and *Beilschmiedia tarairi* (McKenzie, *et al*., 1992), and from Cuba on dead leaves of *Calophyllum antillanum* (Holubová-Jechová & Castañeda-Ruíz, 1986), and *Roystonea regia* (Mercado-Sierra & Mena-Portales, 1986).

Corynespora cassiicola (Berk. & Curt.) Wei, Mycol. Pap. 34:5, 1950.

Conidiophores erect, simple, straight, pale to mid brown, septate, up to 285 µm long, 8-10 µm thick at the base. **Conidiogenous cells** integrated, terminal, percurrent, cylindrical or doliiform. **Conidia** obclavate to cylindrical, subyaline to pale brown, smooth, with up to 20 pseudosepta, 60-110 µm long, 15-20 µm thick, 6-8 µm wide at the truncate base.
Material examined. On dead herbaceous stem. 20-V-94, Mercado CB240.
Distribution. This species is common in the tropics, occurring on dead leaves and herbaceous stems of a wide range of host plants. It is often responsible for leaf spots (Ellis, 1971). It has been recorded from Ghana (Hughes, 1952), Australia (Ellis, 1957; Matsushima, 1989), U.S.A. (Luttrell, 1963; Dyko & Sutton, 1979), Japan (Matsushima, 1980), Cuba (Mercado-Sierra, 1981, 1984; Mena-Portales & Mercado-Sierra, 1987a), and Peru (Matsushima, 1993).

Corynespora gigaspora (Berk. & Br.) M. B. Ellis, Mycol. Pap. 65:7, 1957.

Conidiophores erect, simple, straight or flexuous, dark-reddish brown, septate, 330-560 µm long, 15-25 µm thick. **Conidia** obclavate, truncate at the base, smooth, pale to dark golden brown, usually dark at the scar, pseudoseptate, 105-138 µm long, 30-38 µm thick, 9-11 µm wide at the scar.
Material examined. On rotten bark. 23-XI-93, Mena CB149-2.
Distribution. This fungus has been recorded on dead branches and wood from Sri Lanka, Australia (Ellis, 1957) and Cuba (Holubová-Jechová, 1988a; Mercado-Sierra & Mena-Portales, 1992).

Corynespora siwalika (Subram.) M. B. Ellis, Mycol. Pap. 82: 53, 1961.

Conidiophores simple, erect, straight, single or in groups, dark brown, smooth, septate, up to 350 µm long, 10-15 µm thick. **Conidia** obclavate, pale brown, smooth, pseudoseptate, 73-107 µm long, 16-25 µm wide, 7-9 µm wide at the truncate base.
Material examined. On dead branches and twigs. 23-XI-93, Mena CB163, Mena CB164-1, Rosas CB203.
Distribution. This species have been recorded infrequently. There are records from

India on *Helicteres* (Ellis, 1961), and from Belize on a dead twig (Morris, 1978).

Corynesporopsis rionensis Hol.-Jech.,Česká Mykol. 40(3):147, 1986.

Conidiophores simple, erect, straight, single or in groups, dark brown, smooth, septate, thick walled, 30-90 µm long, 5-6 µm wide. **Conidiogenous cells** integrated, terminal, cylindrical or lageniform, percurrent, 9-14 µm long, 4-5 µm wide. **Conidia** acrogenous, in short chains, fusiform, smooth, brown to dark brown, thick walled, 3-5-septate, 23-30 µm long, 8-11 µm wide, 3-4 µm wide at base.
Material examined.On dead branches and twigs. 29-XII-93, Rosas CB146-2; 19-V-94, Mercado CB222.
Observations. The description from the type collection states that the apical cell of the conidium is paler than the rest. However, this character was not present in our material.
Distribution. This species have been reported only from Cuba on dead branches (Holubová- Jechová & Mercado-Sierra, 1986; Mercado-Sierra *et al.*, 1987).

Dictyochaeta lunulospora (Hewings & Crane) Hol.-Jech.,Česká Mykol. 40 (3): 148, 1986.

Conidiophores single or in fascicles, straight to slightly curved, simple, septate, dark brown, paler toward the apex, thick-walled, smooth, up to 120 µm long, 3-5 µm wide at the base. **Conidiogenous cells** phialidic, integrated, terminal, lageniform, thin walled, hyaline at the apex with cylindrical to funnel-shaped collarette, up to 3 successive proliferations. **Conidia** hyaline, sigmoid, aseptate, 7-12 µm long, 0.5-1.0 µm wide.
Material examined. On dead palm petiole. 23-XI-93, Rosas CB171-4.
Distribution. The type species was collected on an unidentified herbaceous stem from Venezuela (Hewings & Crane, 1981). It has since been recorded from Cuba on dead petiole of *Roystonea regia* and other palms (Holubová-Jechová, 1982, Holubová-Jechová & Mercado-Sierra, 1986), and from Malaysia, on decaying twigs of unidentified dicotyledons (Kuthubutheen & Nawawi, 1991).

Exserticlava triseptata (Matsushima) Hughes, N. Z. J. Bot. 16:333, 1978.

Conidiophores solitary, simple, erect, straight or flexous, smooth, septate, thick-walled, brown to dark brown, paler towards the apex, up to 469 µm high, 10-12 µm wide, often swollen at the base, 13-17 µm wide. **Conidiogenous cells** terminal, clavate, hyaline, apical, swelling, 18-32 µm long, 10-12 µm wide. **Conidia** broadly obovoid to broadly ellipsoid, smooth, pale brown, 3-distoseptate, 27-33 µm long, 13-16 µm wide.
Material examined. On dead rachides of palm. 23-XI-93, Rosas CB183-1.
Distribution. This fungus have been recorded from Japan on dead stems of

Phyllostachys edulis (Matsushima, 1975), from Kenya on dead stem of *Arundinaria alpina* (Kirk, 1985) and from Peru, on decaying palm petioles (Matsushima, 1993).

Exosporium ampullaceum (Petch) M. B. Ellis, Mycol. Pap. 82:32-33, 1961.

Conidiophores straight or flexuous, simple, mid to dark brown, smooth to slightly verruculose, 107-438 µm long, 10-13 µm wide. **Conidiogenous cells** polytretic, integrated, terminal, cylindrical or clavate, cicatrized scars often dark and prominent. **Conidia** obclavate, pale to dark brown, slightly verrucose, pseudoseptate, basal cell subhyaline with a thick dark scar, 78-104 µm long, 20-30 µm wide, 6-8 µm wide at the base.
Material examined. On fallen twigs. 22-XI-93, Heredia CB120-3, CB125-1; 23-XI-93, Heredia CB113-2, CB158-2, CB173-3, Mena CB143, Rosas CB144-3, CB198.
Distribution. This species have been collected on dead twigs and branches of *Funtumia, Rauwolfia,* and *Theobroma* from Sri Lanka, Ghana, Sierra Leone (Ellis, 1971), on rotten bark from Micronesia (Matsushima, 1981), on rotten stem of *Phyllostachys edulis* from Japan (Matsushima, 1987), on palm-leaf and on decaying twigs from Peru (Matsushima, 1993).

Exosporium monanthotaxis Pirozynski, Mycol. Pap. 129:47-50, 1972.

Synnemata erect, cylindric, dark brown, up to 1.6 mm high, 80-160 µm wide at the base, gradually tapering to the apex. **Conidiophores** unbranched, dark brown, 4-5 µm wide with the terminal portion 9-11µm, splaying out laterally along the upper half or two thirds of the synema. **Conidiogenous cells** clavate, with black scars at the apex, 16-25 µm x 9-11µm wide. **Conidia** ovoid, obclavate, smooth to finely echinulate, yellow brown, base with a black truncate scar, paler towards the apex, pseudoseptate 50-97 µm long, 16-20 µm wide.
Material examined. On dead twigs. 23-XI-93, Heredia CB161-1, Rosas CB162-1.
Distribution. Pirozynski (1972) described the type material on dead twigs of *Monanthotaxis poggei* from Tanzania; it has been also recorded on dead twigs from India, Puerto Rico and Venezuela (Ellis, 1976).

Exosporium pterocarpi M. B. Ellis, Mycol. Pap. 82:36-37, 1961.

Conidiophores caespitose, straight or flexuous, unbranched, dark brown, smooth to lightly verruculose at the apex, septate up to 205 µm long, 7-9 µm wide. **Conidiogenous cells** clavate, 20-35 µm long, 10-11µm wide. **Conidia** obclavate to cylindric, pale to dark brown, smooth, pseudoseptate, with a black truncate scar, 67-101 µm long, 8-13 µm wide.
Material examined. On dead branches. 23-XI-93, Rosas CB195-1; 19-V-94, Heredia CB211, CB216.
Distribution. This species is known from Malaya on leaves of *Pterocarpus* (Ellis, 1961) and from Cuba on dead branches of *Passiflora* sp. and other herbaceous stems

(Mercado-Sierra & Mena-Portales, 1992).

Graphium calicioides (Fr.) Cooke & Massee, Grevillea 16:11, 1887.

Synnemata straight or flexuous, smooth, apex rounded with a slimy head, dark brown to black, up to 545 µm long, 30-90 µm thick at the base. **Conidiogenous cells** annellides, cylindrical, hyaline, 15-30 µm long, 1-2 µm wide. **Conidia** ellipsoidal to obovoid, hyaline to olivaceous, smooth, aseptate, 2.5-3µm long, 1-1.5 µm wide.
Material examined. On bark and rotten branches. 23-XI-93, Heredia CB186-3; 19-V-94, Heredia CB221.
Distribution. This is a common lignicolous fungus in Europe (Ellis, 1971). It has been recorded from Australia on dead wood and bark of *Beilschmiedia tawa, Nothofagus menziesii, Olearia rani, Weinmannia racemosa* (Hughes, 1978), and has also been isolated from forest soil (Matsushima, 1989).

Gyrothrix podosperma (Corda) Rabenhorst var. ***falcatispora*** Mercado & Mena, Krypt.-Fl. 1:72, 1844. Acta Botanica Hungarica 32 (1-4):195-196, 1986.

Setae intertwined, erect, repeatedly branched, thick walled, septate, dark brown, rough, up to 250 µm high, trunk straight, 4-6 µm wide just above the basal swelling. Primary branches straight or twisted. Secondary branches brown paler to hyaline, tapering to a width of 1 µm at the apices. **Conidiogenous cells** obclavate to lageniform, subhyaline, 6-12 µm high, 3-4µm at the base, 1 µm or less at the apex. **Conidia** aggregated into a whitish layer at the base of setae, falciform, hyaline, smooth, aseptate, 18-20.5 µm long, 1-1.5 µm wide.
Material examined. On decaying leaves. 23-XI-93, Heredia CB172-4.
The variety *falcatispora* was estabilished by Mercado and Mena (1986), to include species with falciform conidia, 13.5 - 20.5 µm long.
Distribution. This variety has hitherto been found only from Cuba (Mercado-Sierra & Mena-Portales, 1986) on leaf litter.

Gyrothrix verticiclada (Goid.) Hughes & Pirozynski, N. Z. J. Bot. 9: 39-45, 1971.
=*Peglionia verticiclada* Goidàn., Malpighia 34:7, 1935.

Setae erect, straight, smooth, thick-walled, dark brown, 3-5-septate, 45- 60 µm high, 6-8 µm thick near the swollen base, tapering to 5.5-7.5 µm at the apex wich bears 2-4, 1-5 septate, branches up to 65 µm long, 4.5-6 µm wide, tapering to 1.5-2 µm wide at the pale brown apex. **Conidiogenous cells** lageniform, hyaline to subhyaline, 5-7 µm high, 2-3 µm wide at the base. **Conidia** falcate, non-septate, hyaline, 14-17 µm long, 1-1.5 µm wide.
Material examined. On decaying leaves. 23-XI-93, Rosas CB170-3.
Distribution. This fungi is a leaf litter inhabitant. The type collection was described from Italy on leaves of *Laurus nobilis* and *Prunus laurocerasus*, Hughes &

Pirozynski (1971) redescribed the species on leaf litter of *Knightia excelsa* from New Zealand. It has been recorded also from Cuba on leaves of *Clusiae minor* (Castañeda-Ruíz, 1986), New Zealand on *Myrsine chathamica* (McKenzie, 1991). Kirk (1992) collected the species from the British Isles on *Laurus nobilis* and *Quercus ilex*, the same author mentions reports from Australia on *Araucaria, Callistemon, Eucalyptus* and *Podocarpus*, from India on *Cinnamomum, Jacaranda, Mahonia, Neolistsea, Podocarpus, Rhododendron, Rhopala,* from Kenya on *Eucalyptus, Podocarpus* and from the Canary Islands on *Laurus azorica.*

Hermatomyces sphaericum (Sacc.) Hughes, Mycol. Pap. 50:100, 1953.
=*Stemphylium sphaericum* Sacc. , Atti Accad. Sci. Ven.-trent.-istr., Pag. 86, 1919.

Colonies dark brown to blackish brown. **Mycelium** partly superficial, circulary surrounding the fertile area. **Conidiophores** cylindrical, simple and forked, pale brown, up to 14 µm long, 2.5-3.5 µm wide. **Conidia** globose, oval, somewhat flattened, dark brown in the middle and paler towards the margins, 24-29 µm long, 24-30 µm wide and 15-21 µm thick.
Material examined. On fallen twigs and branches of angiosperms and on palm petiole. 22-XI-93, Mena CB115-1, CB181-1, Heredia CB125-2, CB129-4; 23-XI-93, Rosas CB146-1, Rosas CB171-3, Mena CB152-1, Heredia CB173.
Distribution. This tropical species could be considered lignicolous. It is known from Ghana on dead branches of *Averrhoae carambolae*, from Sierra Leone on *Alchorneae cordifoliae*, *Coffeae libericae* and dead rachides *of Elaeidis guineensis* (Hughes, 1953) and from Cuba (Holubová-Jechová & Mercado-Sierra, 1986), also on dead branches.

Idriella fertillis (Pirozynski & Hodges) Matsushima, Icones Microfungorum a Matsushima Lectorum. Pag. 86, 1975.
=*Circinotrichum fertile* Pirozynski & Hodges. Can. J. Bot. 51:160-162.

Conidiophores erect, straight, dark brown, smooth, thick-walled 120-135 µm long, 5-7 µm wide. **Conidiogenous cells** ampulliform to lageniform, subhyaline, crowed, arising in groups, on one or more points around the conidiophore, generally from midway to the apex, 8-10 µm long, 3-4 µm wide. **Conidia** subfalcate, rounded at the apex, colorless, 10-15 µm long, 1-1.5 µm wide.
Material examined. On dead leaves. 23-XI-93, Heredia CB172-1.
Distribution. This fungus has been collected only on dead leaves. There are reports from U.S.A. on *Persea borboniae* (Pirozynski & Hodges, 1973), Japan on *Sequoia sempervirensis*, *Castanopsis cuspidatae*, *Tsugae sieboldii, Cinnamomun* sp. and undetermined leaves (Matsushima, 1975; Matsushima, 1980), Ivory Coast (Onofri & Castagnola, 1982) and Cuba (Mercado-Sierra & Mena-Portales, 1986).

Masoniomyces claviformis Crane & Dumont, Can. J. Bot. 53:847-849, 1975.

Conidiophores simple or branched, straight or flexuous, brown to mid brown, verrucose, multiseptate, up to 550 µm long, 7-11 µm wide at the base. **Conidiogenous cells** discrete, polyblastic. **Conidia** ellipsoidal to slightly fusiform, aseptate, subhyaline, 5-8 µm long, 1.5-2 µm wide.
Material examined. On bark. 22-XI-93, Rosas CB117-1.
Distribution. *M. claviformis* has been recorded from Jamaica on wood (Crane & Dumont, 1975) and from Cuba (Mena-Portales & Mercado-Sierra, 1987b; Holubová-Jechová & Mercado-Sierra, 1989) on dead branches.

Melanocephala triseptata (Shearer, Crane & Miller) Hughes, N. Z. J. Bot. 17: 171, 1979.

Conidiophores single and scattered or in groups, straight, septate, smooth, with percurrent proliferations, mid brown, becoming paler towards the apex, up to 204 µm long, 8-9 µm wide. **Conidiogenous cells** monoblastic, integrated, terminal, cylindrical. **Conidia** broadly obovoid, brown to dark brown, 3-septate with black bands, smooth, obtuse at the apex, truncate at the base, 19-29.5 µm long, 18-25.5 µm thick, 6-8 µm wide at the base.
Material examined. On bark. 23-XI-93, Rosas CB174.
Observations. Our material has conidia and conidiophores that are wider than those in the type species and in subsequent collections. However, conidiogenesis and the other features are characteristics of *M. triseptata*. Size difference alone does not justify erection of a new species.
Distribution. This species have been collected from U.S.A, on decayed wood (Shearer, *et al.*, 1976), from Cuba on decaying petioles of *Roystonea regia*, on dead rotten wood and branches (Mercado-Sierra, 1982; Holubová-Jechová & Mercado-Sierra, 1984; Mena-Portales & Mercado-Sierra, 1987b), from Japan on rotten wood (Matsushima, 1980), from South Africa on dead decorticated wood (Morgan-Jones *et al.*, 1983) and from Peru on decaying palm-petioles (Matsushima, 1993).

Memnoniella subsimplex (Cooke) Deighton, Mycol. Pap.78:5-7, 1960.

Conidiophores unbranched, swollen at the apex, olivaceous to mid grey, minutely verruculose, septate, up to 200 µm long, 3-6 µm wide.**Conidiogenous cells** monophialidic, in groups, clavate, pale gray to hyaline, 9-13 µm long, 5-6 µm wide. **Conidia** catenate, simple, spherical or subspherical, verrucose, with large warts, dark brown, 7-9 µm diam.
Material examined. On dead petiole and leaves of *Musa* sp. 23-XI-93, Rosas CB131-3, CB136-2; 19-V-94, Rosas CB225-1.
Distribution. This species has been collected frequently on *Musa* leaves. It also ocurrs on others plant debris and soil. There are reports from Bermuda, Ghana, New Zealand, Sierra Leone, Sudan Republic, U.S.A., Venezuela (Ellis, 1971), Solomon Islands (Matsushima, 1971), Japan (Matsushima, 1975, 1980), Cuba (Mercado-Sierra,

1984; Holubová-Jechová & Mercado-Sierra, 1986) and Peru (Matsushima, 1993).

Monodictys paradoxa (Corda) Hughes, Can. J. Bot. 36:786, 1958.

Conidiophores unbranched, cells nearly always swollen, hyaline, smooth. **Conidia** oblong rounded at the ends, ellipsoidal, pyriform or subspherical, muriform, smooth, brown to pale brown, with basal cells paler than the others, 40-56 µm long, 25-39 µm wide.
Material examined. On bark and fallen twigs and branches. 23-XI-93, Heredia CB150-5; 19-V-94, Mercado CB220; 20-V-94, Heredia CBCB239-2.
Distribution. *M. paradoxa* has been reported from Canada on bark of *Betula papyrifera* (Sutton, 1973), form Japan on bark of *Pruni yedoensis*, dead twigs and on *Agaricus campestris* (Matsushima, 1975, 1980), from Hungary on bark of dead trunk of *Betula* sp. and *Populus alba* (Holubová-Jechová, 1979), from Cuba on dead bark of *Nectandra* sp. (Mercado-Sierra, 1981) and from Peru on decaying palm petioles (Matsushima, 1993).

Neosporidesmium maestrense Mercado & Mena, Acta Bot. Cubana 59:2-6, 1988.

Synnemata cilindrical, dark brown to black, up to 2500 µm high, 280 µm thick at the base, 45-60 µm at the apex. **Conidiophores** unbranched, cylindric, smooth, brown to pale brown at the apex, splaying out laterally and at the top of the synnema, 5-6 µm wide and markedly swollen at the apex 7-8.5 µm wide. **Conidiogenous cell** monoblastic, integrated, terminal, percurrent, simple, doliiform, mid brown, 18-25 µm long, 7-10 µm thick in the broadest part, 6-7 µm at the base and 5-6 µm at the apex. **Conidia** obclavate, fusiform, pale to mid brown, 8-12-septate; 60-79 µm long, 15-17.5 µm wide, 5-6 µm wide at the base; 3-5 µm at the apex.
Material examined. On dead branches. 19-V-94, Mercado CB218.
Distribution. *N. maestrense* is a monotypic genus, collected on dead branches of *Urere baccifera* from Cuba (Mercado-Sierra & Mena-Portales, 1988). The present collection would appear to represent the first record of this species since its description.

Nodulisporium gregarium (Berk. & Curt.) Meyer, Revue Mycol., 29:310, 1965.

Synnemata up to 1-2 µm high, dark brown, hyphae of stipe 3-4 µm wide, brown slightly roughened to verrucose. **Conidiophores** branching irregularly, metulae, when present, 10-18 µm long, 2-3 µm wide, verrucose, brown. **Conidiogenous cells** 10-20 µm long, 1.5-3 µm wide. **Conidia** ovoid with a truncate base, 4-6 µm long, 2.5 -3.5 µm wide.
Material examined. On bark. 23-XI-93, Rosas CB159.
Distribution. This species is common on dead wood in the tropics (Ellis, 1971). It has been recorded from Java on bark (Seifert, 1990), from Peru on decaying palm-

petioles (Matsushima, 1993). Petrini and Dreyfuss (1981) reported it as an endophyte of tropical epiphytes belonging to Araceae, Bromeliaceae and Orchidaceae.

Periconia byssoides Pers., Syn. Meth. Fung., Pag. 686, 1753.

Conidiophores straight, erect, pale to dark brown, smooth, up to 700 µm long, 15-27 µm wide at the base, 10-18 µm immediately below the head. **Conidia** spherical, brown, verruculose, 12-16 µm diam.
Material examined. On dead leaves, bark and fallen twigs. 22-XI-93, Rosas CB112-2; 23-XI-93, Heredia CB148-3, Rosas CB155-1, CB192; 19-V-94, Heredia CB224-3, Mercado CB229, Rosas CB212, CB213, CB215; 20-V-94, Heredia CB233-1.
Distribution. This species is very common on plant litter from tropical and temperate areas. The known distribution includes Ghana (Hughes, 1953), Germany, Great Britain, Malaya, Australia, New Zealand, U.S.A. (Mason & Ellis, 1953), Solomon Islands (Matsushima, 1971), Japan (Matsushima, 1975; 1980) and Cuba (Mercado-Sierra, 1981, 1984; Holubová-Jechová & Mercado-Sierra, 1984, 1989; Mercado-Sierra & Mena-Portales, 1986; Mena-Portales & Mercado-Sierra,1987b). In Mexico, *P. byssoides* was isolated from leaf litter (Onofri, 1984) and soil of *Coffea arabica* rhizosphere collected in Veracruz (Persiani & Maggi, 1988).

Periconia minutissima Corda, Icon. Fung.1:19, 1837.

Conidiophores arise singly or in groups, the stipe is straight or flexuos, often swollen at the base, pale brown to brown, smooth, septate, up to 500 µm long, 8-10 µm wide immediately below the head. **Conidia** spherical, straw-coloured to pale brown, verruculose, 5-6 µm diam.
Material examined. On dead stem. 23-XI-93, Mena CB166-4.
Distribution. This is a very common and widely distributed saprobe on dead sticks, stems, leaves and other plant parts (Hughes, 1953). The known distribution includes Ghana (Mason & Ellis, 1953), Czechoslovakia, Great Britain, Italy (Hughes, 1953), Kenya, Pakistan, Sierra Leone, Sudan, Zambia (Ellis, 1971), Tanzania (Pirozynski, 1972), New Zealand (Hughes, 1978), Belize (Morris, 1978) and Cuba (Mercado-Sierra, 1981, 1984; Mercado-Sierra & Mena-Portales, 1986).

Phaeoisaria clematidis (Fuckel) Hughes, Can. J. Bot. 36:795, 1958.

Synnemata subulate, smooth, straight or flexuous, pale to mid brown up to 400 µm high, 35-60 µm thick at the base. **Conidiogenous cell** cylindrical or clavate, denticulate, pale brown to hyaline. **Conidia** ellispoidal, smooth, hyaline, aseptate, 4-6 µm long, 1-2.5 µm wide.
Material examined. On fallen branches and twigs. 23-XI-93, Heredia CB150-2, CB186-1, Mena CB177, CB201-1, Rosas CB140-1, CB146-3, CB168; 20-V-94, Rosas CB236-1.

Distribution. This is a common species on plants remains of a wide range of hosts. It has been collected in Ghana, Java, Malaya, New Guinea, Sabah, Sierra Leone (Ellis, 1971), Japan (Matsushima, 1975, 1980), New Zealand (Hughes, 1978), Belize (Morris, 1978), Hungary (Holubová-Jechová, 1979), the British Isles (Kirk, 1983), Cuba (Holubová-Jechová & Mercado-Sierra, 1986, 1989; Mercado-Sierra & Mena-Portales, 1986; Mena-Portales & Mercado-Sierra, 1987b) and Peru (Matsushima, 1993).

Piricauda cochinensis (Subram.) M. B. Ellis, 1976. More Dematiaceous Hyphomycetes. Pag. 367, 1976.

Colonies effuse, dark brown. **Conidiophores** semi-macronematous. **Conidia** variable in shape, spherical, pyriform, muriform, dark brown, lightly verrucose at base, 60-73 µm x 55-65 µm, with up to 13 septate appendages, pale brown, 50-105 µm long, 4-6 µm wide at the base, 3-4.5 µm wide at the apex.
Material examined. On rachides of palm tree. 20-V-94, Mercado CB235-2.
Distribution. This species have been recorded from India (type collection) on dead spathes of *Cocos nucifera* (Ellis, 1976), from Cuba on dead leaves, petioles and rachides of palm tree (Holubová- Jechová & Mercado-Sierra, 1986, 1989) and from Japan on decomposing leaves of *Satakentia liukivensis* (Nakagiri & Ito, 1995).

Piricaudilium lobatum Hol.-Jech., Česká Mykol. 42:200-203, 1988.

Colonies effuse, dark brown, granulose. **Conidia** aseptate, turbinate, irregularly lobed, 23-40 µm in diam, 22-30 µm high, pale brown to brown, in the basal part around the basal porus darker and verrucose to spinulose, in the upper part with 4-10 appendages arising from distinct lobes, septate, pale brown, up to 52 µm long, 3-4.5 µm wide, near the base up to 5-10 µm wide.
Material examined. On dead branches, twigs, petiole and rotten *Musa* sp. stem. 22-XI-93, Rosas CB111-2, Mena CB127-2; 23-XI-93, Mena CB152-3, CB188-2, 20-V-94, Mercado CB234-2.
Distribution. The present collection would appear to represent the first record of this species since its description. The genus *Piricaudilium,* proposed by Holubová-Jechová (1988b) is monotypic. This species is characterized by the presence of inner hyaline hyphae in the conidia.

Pleurographium simplex (Berk. & Br.) Hughes, Can. J. Bot. 36:798, 1958.

Conidiophores erect, septate, mid to dark brown, paler at the apex, 110-150 µm long, 4-5 µm thick, slightly swollen at the base, 7-8 µm. **Conidia** narrowly ellipsoidal to subclavate rounded at the apex, tapered to a point at the base, hyaline to pale brown, smooth, 3-septate, 10-15 µm long, 3.5-4 µm wide.
Material examined. On dead twigs. 23-XI-93, Rosas CB141-1.

Distribution. This species is common on dead stems from different hosts in Europe (Ellis, 1971). It has been also collected from Tanzania, on dead rachides of oil palm (Pirozynski, 1972) and from Belize, on dead woody branches (Morris, 1978).

Sporoschisma nigroseptatum Rao & Rao, Mycopath. Mycol. Appl. 24:82, 1964.

Conidiophores dark brown, up to 240 µm long, 8-10 µm wide at the base, 13-18 µm wide at the apex. **Capitate hyphae** erect or slightly bent, subulate with a swollen basal cell, dark brown, paler above, up to 220 µm long, 8-10 µm wide at the base, tapering to 4.5-5 µm below the swollen apex. **Conidia** cylindrical with flattened or slightly rounded ends, 5-septate, the three central septa obscured by darkly pigmented bands, median cells dark brown, end cells subhyaline, wall smooth, 28-42 µm long, 9-13 µm wide.
Material examined: On rotting leaves 20-VI-94, Rosas CB232-2.
Distribution. This species was described on material from India. Subsequent reports are from New Zealand on rotting leaves of *Cortaderia atacamensis* (Hughes, 1966), from Japan on dead leaves of *Pandani tectorii* var *liukivensis* (Matsushima, 1975), and from Cuba on dead petiole of *Roystonea regia* and rotten wood (Mercado-Sierra, 1982, 1984; Holubová-Jechová & Mercado-Sierra, 1984, 1986, 1989).

Virgariella oblonga Matsushima, Icones Microfungorum a Matsushima Lectorum. Pag. 163, 1975.

Conidiophores erect, unbranched, straight or flexuous, thicker at the base, dark brown, paler at the apex, smooth, 150-300 µm long, 4-6 µm wide. **Conidiogenous cells** integrated, terminal, denticulate. **Conidia** ellipsoidal, dark browm, smooth, aseptate, 9-15 µm long, 6-8 µm wide.
Material examined: On dead leaves of *Musa* sp. and petioles of palm tree. 23-XI-93, Rosas CB131-2; 19-V-94; Rosas CB225-1.
Observations. Except for the length of the conidiophore, all the characteristics of our material match with the type description.
Distribution. This fungus has been reported from Japan (Matsushima, 1975) on decaying bark, from the U.S.A. (Dyko & Sutton, 1979) and from Peru on decaying palm-petioles (Matsushima, 1993).

Virgatospora echinofibrosa Finley, Mycologia 59:538-541, 1967.

Synnemmata straight of flexuous, grey to black, paler at the base, up to 1.5 µm high, 40-70 µm thick. **Conidiophores** smooth to finely echinulate, unbranched and tightly adpressed along most of their length but separating at the apex. **Conidiogenous cells** monophialidic, arranged penicillately, cylindrical to clavate, finely echinulate, 12-28 µm, 3-4.5 µm. **Conidia** aggregated in slimy black heads, ellipsoidal, fusiform, papillate at each end, grey to dark green, with longitudinals striations, 3-septate when

mature, 33-52 µm long, 12-17 µm wide.
Material examined: On fallen branches and twigs. 22-XI-93, Rosas CB122-2; 23-XI-93, Heredia CB113-1, CB139-1, CB150-1, CB189; Mena CB133-1, CB145-2, CB156, CB180-2, CB190; Rosas CB144.
Distribution. *V. echinofibrosa* is a tropical fungus, whose known distribution is confined to America. The type species was described from dead twigs collected in the Panama Canal Zone (Finley, 1967). Later, it was reported from Costa Rica (Morris, 1972) on bamboo, from Belize on dead herbaceous stem and dead bark (Morris, 1978), from Cuba on dead leaves and branches (Mercado-Sierra & Mena-Portales, 1992). Recently, Bills *et al.* (1994) reported *V. echinofibrosa* as a latent endophyte isolated from living twigs of *Inga goldmanii* from Costa Rica.

Zygosporium echinosporum Bunting & Mason in Mason, Mycol. Pap. 5:135-137, 1941.

Conidiophores cylindric, pale brown to brown, septate, smooth, up to 70 µm long, 2-4 µm wide, with long stalks, with a sterile apical region tapering in a hyaline knob 5-6 µm diam. **Vesicles** curved, swollen, dark brown, 10-15 µm long, 6-10 µm thick in the broadest part. **Conidiogenous cells** born on the vesicles, ampulliform or ellipsoidal, thin-walled, pale. **Conidia** spherical, hyaline to pale brown, verruculose, aseptate, 6-9 µm diam.
Material examined: On dead leaves. 22-XI-93, Rosas CB126-3.
Distribution. Ellis (1971) included the follow substrates and distribution; on dead leaves of *Artocarpus*, *Cocos nucifera*, *Cola lateritia*, *Cordia*, *Desplatzia lutea*, *Ficus*, *Hyphaene thebaica*, *Milletia*, *Pancovia bijuga*, *Theobroma*, and isolated from cheese; known from Ghana, Nigeria, Sierra Leone, Trinidad. It has been also isolated from air in the Hawaii (Wang & Baker, 1967), from Japan on *Arecha catechu* and *Swietenia macrophylla* leaves (Matsushima, 1980), from the British Isles on *Laurus nobilis* leaf litter (Sutton & Pirozynski, 1963; Kirk, 1983), from Peru on decaying palm petioles and leaves of "Oje" (local name) (Matsushima, 1993).

Zygosporium minus Hughes, Mycol. Pap. 44: 6-7, 1951.

Conidiophores subulate, pale brown to brown, septate, smooth, up to 48 µm long, 1-5 µm thick at the base, 1- 1.5 µm wide at the apex, bearing a single vesicle laterally on a short stalk just above the base. **Vesicles** curved, swollen, dark brown, 14-15 µm long, 8-11 µm thick in the broadest part. **Conidiogenous cells** born on the vesicles, ampulliform curved, thin-walled, hyaline. **Conidia** sphaerical, hyaline to very pale brown, verruculose, aseptate, 4-9 µm diam.
Material examined: On a dead petiole. 22-XI-93, Rosas CB116.
Distribution. This fungus has been collected from Ghana on dead leaves of *Artocarpus nobilis*, *Cola lateritia, Crinum* sp. (Hughes, 1952), from India, the Philippines, Sierra Leone, Venezuela, Zambia on dead leaves of *Cocos nucifera*,

Elaeis, *Ficus*, *Musa*, *Polyalthia*, *Solanuam*, *Tabebuia* (Ellis, 1971), from Tanzania (Pirozynski, 1972), from New Zealand on dead sheaths of *Rhopalostylis sapida* (Hughes, 1978) and from Cuba on dead leaves of *Tournefortia hirsutissima* (Mercado-Sierra, 1980).

SPECIES PREVIOUSLY RECORDED FROM MEXICO

Beltrania rhombica O. Penzig, Nuovo G. bot. ital. 14:72-75, 1882.
Material examined. On leaf litter. 23-XI-93, Rosas CB170-1; Heredia CB172-3.
Distribution. Common on dead leaves of many tropical plants. In Mexico it has been reported on dead leaves of *Quercus germana, Q. xalapensis, Q. sartori* and *Liquidambar macrophylla* (Heredia, 1993; Heredia, 1994).

Dendryphion comosum Wallr., Fl. crypt. Germ. 2: 300, 1833.
Material examined. On dead branches. 20-V-94, Mercado CB234-2.
Distribution. This species is very common on dead stems of herbaceous plants from tropical and template areas. It was described from Mexico on leaf litter (Mercado-Sierra & Heredia, 1994).

Dictyosporium heptasporum (Garov.) Damon, Lloydia 15: 118, 1952.
Material examined. On leaves litter and dead petioles of *Acrocomia mexicana*. 22-XI-93, Heredia CB120-2; 23-XI-93, Rosas CB187-5, Mena CB191-3.
Distribution. Described for Mexico on dead leaves of *Quercus germana* (Heredia, 1993).

Menisporopsis theobromae Hughes, Mycol. Pap. 48:59-61, 1952.
Material examined. On decaying leaves. 22-XI-93, Mena CB132-4, 23-XI-93, Rosas CB135-4, Heredia CB172-2.
Distribution. *M. theobromae* has a tropical distribution, it was recorded from Mexico, on leaf litter of *Quercus germana* (Heredia, 1994).

Phitomyces chartarum (Berk. & Curt.) M. B. Ellis, Mycol. Pap. 76:13-15, 1960.
Material examined. On bark, twigs, dead stem, leaves and petioles. 23-XI-93, Rosas CB154, CB155, CB198, Mena CB166-1, CB193; 19-V-94, Heredia CB224-1, Mercado CB229; 20-V-94, Heredia CB233-5.

Pithomyces maydicus (Sacc.) M. B. Ellis, Mycol. Pap. 76:15, 1960.
Material examined: On fallen twigs. 23-XI-93, Rosas CB155-3.
Distribution. Both species are cosmopolitan and very common on plant debris, with a wide distribution mainly in tropical biomes, Heredia *et al.* (1995) reported both from Mexico on decaying leaves.

Stachylidium bicolor Link, Mag. Ges. Naturf. Freunde Berlin, 3 (1):15, 1809.
Material examined: On herbaceus stem. 19-V-94, Mercado CB214-2.
Distribution. A very common fungus on great variety of herbaceous and woody substrata. Recorded for Mexico on leaf litter (Onofri, 1984) and decaying leaves of *Q. germana* (Mercado-Sierra & Heredia, 1994).

Torula herbarum (Pers.) Link, Mag. Ges. Naturf. Freunde Berlin, 3 (1):21, 1753.
Material examined: On dead branches and dead petiole. 23-XI-93, Heredia CB134-2, Mena CB166; 20-V-94, Rosas CB187-1, Mercado CB234-1.

Torula herbarum (Pers.) Link f. ***quaternella*** Sacc., Ann. Mycol. 11:556-557, 1913.
Material examined: On dead bark and twigs. 22-XI-93, Heredia CB118-1; 23-XI-93, Heredia CB169-1, CB148-2; Mena CB191-1, Rosas CB141-2; 20-V-94, Heredia CB233-2, CB246, Rosas CB243-1, CB232-8.
Distribution. Cosmopolitan species, very common on plant litter. Both species were described for Mexico on plant debris (Mercado-Sierra & Heredia, 1994).

Xenosporium berkeleyi (Curt.) Pirozynski, Mycol. Pap. 105:27, 1966.
Material examined: On bark. 19-V-94, Heredia CB228.
Distribution. Common as a lignicolous hyphomycete. Reported from Mexico on fallen twigs (Mercado-Sierra & Heredia, 1994).

Zygosporium oscheoides Mont., Ann. Sci. Nat., Paris, Sér. 2, 77: 121, 1842.
Material examined: On dead leaves 22-XI-93, Rosas CB126-1; 19-V-94, Mercado CB227.
Distribution. Cosmopolitan species, very common on plant litter. Reported from Mexico on herbaceous stem (Mercado-Sierra & Heredia, 1994).

ACKNOWLEDGMENTS

The authors express their gratitude to Dr. R. D. Goos for kindly reviewing the manuscript and for helpful suggestions. This work was supported by Grant PO30 from the CONABIO (Comisión Nacional para el Conocimiento y Uso de la Biodiversidad) from Mexico. We also acknowledge Biol. Greta Rosas Saito for technical assistance.

LITERATURE CITED

Bills, G., A. Y. Rossman and J. Polishook. 1994. Rediscovery of *Albosynnema elegans* and *Solheimia costaspora*. *Sydowia* 46 (1): 1-11.

Castañeda-Ruiz, R. F. 1986. *Fungi Cubense.* Inst. de Investigaciones Fundamentales en Agricultura Tropical "Alejandro de Humboldt", Habana: 1-20.

Crane, J. L. and K. P. Dumont. 1975. Hyphomycetes from the West Indies and Venezuela. *Can. J. Bot.* 53 (9): 845-851.

Dyko, B. T. and B. C. Sutton. 1979. New and interesting Dematiaceous hyphomycetes from Florida. *Mycotaxon* 8 (1): 119-124.

Ellis, M. B. 1957. Some species of *Corynespora. Mycol. Pap.* 65: 15p.

Ellis, M. B. 1961. Dematiaceous Hyphomycetes. II. *Mycol. Pap.* 79: 1-23.

Ellis, M. B. 1965. Dematiaceous Hyphomycetes. VI. *Mycol. Pap.* 103: 46p.

Ellis, M. B. 1971. *Dematiaceous Hyphomycetes.* Commonwealth Mycological Institute, Kew, England.

Ellis, M. B. 1976. *More Dematiaceous Hyphomycetes.* Commonwealth Mycological Institute, Kew, England.

Estrada, A. 1982. Survey and census of howler monkeys (*Alouatta palliata*) in the rain forest of "Los Tuxtlas", Veracruz, México. *American Journal of Primatology* 2: 363-372.

Finley, D.1967. *Virgatospora*: A new genus of Stilbellaceae. *Mycologia* 59:538-541.

Gessner, R. V and R. D. Goos. 1973. Fungi from *Spartina alterniflora* in Rhode Island. *Mycologia* 65 (6): 1296-1301.

Gómez-Pompa, A., S. del Amo, C. Vásquez-Yañes and A. Butanda. Editores. 1979. *Investigaciones sobre la regeneración de selvas altas en Veracruz, México.* Instituto Nacional de Investigaciones Sobre Recursos Bióticos, México, D. F.

Gómez-Pompa, A and S. del Amo. Editores. 1985. *Investigaciones sobre la regeneración de selvas altas en Veracruz, México. Vol II.* Editorial Alhambra. México. D.F.

Heredia, G. 1993. Mycoflora associated with green leaves and leaf litter of *Quercus germana, Quercus sartorii* and *Liquidambar styraciflua* in a mexican cloud forest. *Cryptogamie, Mycol.* 14 (3): 171-183.

Heredia, G. 1994. Hifomicetes dematiaceos en bosque mesófilo de montaña. Registros nuevos para México. *Acta Bot. Mexicana* 27: 15-32.

Heredia, G., A. Mercado-Sierra and J. Mena-Portales. 1995. Conidial Fungi from leaf litter in a mesophilic cloud forest of Veracruz, Mexico. *Mycotaxon* 55:473-490.

Hewings, A. and J. L . Crane. 1981. The Genus *Codinae.* Three new species from the America. *Mycotaxon* 13 (2): 419-427.

Holubová-Jechová, V. 1979. Lignicolous and some other saprophytic Hyphomycetes from Hungary. *Česká Mykol.* 33: 137-149.

Holubová-Jechová, V. 1982. New or interesting phialidic Hyphomycetes from Cuba. *Mycotaxon* 15: 277-292.

Holubová-Jechová, V. and A. Mercado-Sierra. 1984. Studies on Hyphomycetes from Cuba II. Hyphomycetes from the Isla de la Juventud.*Česká Mykol.* 38 (2): 96-120.

Holubová-Jechová, V. and R. F. Castañeda-Ruiz. 1986. Studies on Hyphomycetes from Cuba III. New and Interesting dematiaceous taxa from leaf litter.*Česká Mykol.* 40 (2): 74-85.

Holubová-Jechová, V. and A. Mercado-Sierra. 1986. Studies on Hyphomycetes from Cuba IV. Dematiaceous Hyphomycetes from the Province Pinar del Rio. *Česká Mykol.* 40 (3): 142-164.

Holubová-Jechová, V. 1988a. Studies on Hyphomycetes from Cuba VII. Seven new taxa of dematiaceous Hyphomycetes.*Česká Mykol.* 42 (1): 23-30.

Holubová-Jechová, V. 1988b. Studies on Hyphomycetes from Cuba VIII. A New genus *Piricaudilium* and some species new for the territory of Cuba.*Česká Mykol.* 42 (4): 200-204.

Holubová-Jechová, V. and A. Mercado-Sierra. 1989. Hyphomycetes from Loma de la Coca and some localities of La Habana and Matanzas provinces, Cuba. *Acta Bot. Cubana* 76: 1-15.

Hughes, S. J. 1952. Fungi from the Gold Coast. I. *Mycol. Pap.* 48: 1-91.

Hughes, S. J. 1953. Fungi from the Gold Coast. II. *Mycol. Pap.* 50: 1-104.

Hughes, S. J. 1966. New Zealand fungi 6. *Sporoshisma* Berk. and Br. *N. Z. J. Bot.* 4: 77-85.

Hughes, S. J. and K. A. Pirozynski. 1971. New Zealand Fungi 15. *Beltraniella, Circinotrichum*, and *Gyrothrix* (Syn. Peglionia). *N. Z. J. Bot.* 9: 39-45.

Hughes, S. J. 1978. New Zealand fungi 25. Miscellaneous species. *N. Z. J. Bot.* 16: 311-370.

Kirk, P. M. 1983. New or interesting microfungi X. Hyphomycetes on *Laurus nobilis* leaf litter. *Mycotaxon* 18 (2): 259-298.

Kirk, P. M. 1985. New or interesting microfungi XIV. Dematiaceous hiphomycetes from MT Kenya. *Mycotaxon* 23: 305-352.

Kirk, P. M. 1992. New or interesting microfungi XVI. Hyphomycetes from British Isles. *Mycotaxon* 43: 231-236.

Kuthubutheen, A. J. and A. Nawawi. 1991. *Dictyochaeta guadalcalensis* comb. nov. and several new records of the genus in Malaysia. *Mycol. Res.* 95 (10): 1220-1223.

Lot-Helgueras. La Estación de Biología Tropical los Tuxtlas: Pasado, presente y futuro. 1979. *In*: *Investigaciones sobre la regeneración de selvas altas en Veracruz, México*. Gómez-Pompa, A., C. Vásquez-Yañes, del Amo S. and A. Butanda. INIREB, México, D. F.

Luttrell, E. S. 1963. Taxonomic criteria in *Helminthosporium*. *Mycologia* 55 (5): 643-674.

Mason, E. W. and M. B. Ellis. 1953. British species of *Periconia*. *Mycol. Pap.* 56: 1-127.

Matsushima, T. 1971. *Microfungi of the Solomon Islands and Papua-New Guinea.* Published by the author. Kobe.

Matsushima, T. 1975. *Icones Microfungorum a Matsushima Lectorum*. Published by the author. Kobe.

Matsushima, T. 1980. *Saprophytic microfungi from Taiwan.* Matsushima Mycological Memoirs No. 1. Published by the author. Kobe.

Matsushima, T. 1981. *Matsushima Mycological Memories* No. 2. Published by the author. Kobe.

Matsushima, T. 1983. *Matsushima Mycological Memories* No. 3. Published by the author. Kobe.

Matsushima, T. 1987. *Matsushima Mycological Memories* No. 5. Published by the author. Kobe.

Matsushima, T. 1989. *Matsushima Mycological Memories* No. 6. Published by the author. Kobe.

Matsushima, T. 1993. *Matsushima Mycological Memories* No. 7. Published by the author. Kobe.

McKenzie, E. H. C. 1991. Fungi of the Chatman Islands. *Mycotaxon* 41(1): 195-217

McKenzie, E. H. C. 1992. Fungi of the Karmades Islands. *Mycotaxon* 45: 149-170.

McKenzie, E. H. C., P. J. O'Sullivan and J. P. Wilkie. 1992. A list of type specimens of new Zeland fungi held in DSIR plant protection Herbarium (PDD). *Mycotaxon* 43: 77-156.

Mena-Portales, J. and A. Mercado-Sierra. 1987a. Hifomicetes de topes de Collantes, Cuba. (II. Especies enteroblásticas). *Acta Bot. Hungarica* 33 (1-2): 75-79.

Mena-Portales, J. and A. Mercado-Sierra. 1987b. Algunos Hifomicetes de las provincias Ciudad de la Habana y La Habana, Cuba. *Rep. de Investigación del Instituto de Ecología y Sistemática. Academia de Ciencias de Cuba* 17: 1-17.

Mercado-Sierra, A. 1980. Hifomicetes demaciáceos de Cuba (1). *Acta Bot. Cubana* 1: 1-5.

Mercado-Sierra, A. 1981. Lista preliminar de Hifomicetes demaciáceos de la Estación Ecológica de Sierra del Rosario y zonas adyacentes. *Acta Bot. Cubana* 6: 1-6.

Mercado-Sierra, A. 1982. Hifomicetes dematiáceos de Cuba (2). *Acta Bot. Cubana* 14: 1-7.

Mercado-Sierra, A. 1984. *Hifomicetes Demaciáceos de Sierra del Rosario, Cuba* Editorial Academia. La Habana.

Mercado-Sierra, A. and J. Mena-Portales. 1986. Hifomicetes de Topes de Collantes, Cuba I. (Especies holoblásticas). *Acta Bot. Hungarica* 32 (1-4): 189-20.

Mercado-Sierra, A., V. Holubová-Jechová, J. Mena-Portales and G. González-Fraginals. 1987. Hongos imperfectos de Pinar del Río, Cuba: El ambiente y la taxonomía de hifomicetes dematiáceos hallados. *Rep. de Investigación del Instituto de Ecología y Sistemática. Academia de Ciencias de Cuba* 22: 1-10.

Mercado-Sierra, A. and J. Mena-Portales. 1988. Nuevos o raros hifomicetes de Cuba VI. *Neosporidesmium*, nuevo género sinemático. *Acta Bot. Cubana* 59: 1-6.

Mercado-Sierra, A. and J. Mena-Portales. 1992. Nuevos o raros hifomicetes de Cuba VII. Especies enteroblásticas. *Acta Bot. Hungarica* 37 (1-4): 63-73.

Mercado-Sierra, A. and G. Heredia. 1994. Hyphomycetes asociados a restos vegetales en el Estado de Veracruz, México. *Revista Mexicana de Micología* 10: 33-48.

Morgan-Jones, G., R. C. Sinclair and A. Eicker. 1983. Notes on hyphomycetes. XLIV. New and rare dematiaceous species from the Transvaal. *Mycotaxon*

17: 301-316.

Morris, E. F. 1972. Costa Rican Hyphomycetes. *Mycologia* 64: 887-896.

Morris, E. F. 1978. Belizean hyphomycetes. *Mycotaxon* 7: 265-274.

Nakagiri, A. and T. Ito. 1995. Some dematiaceous Hyphomycetes on decomposing leaves of *Satakentia liukiuensis* from Ishigaki Island Japan. *IFO Res. Comm.* 17: 75-98.

Onofri, S. and M. Castagnola. 1982. Scanning electron microscopy on some dematiaceous sympodially proliferating hyphomycetes. *Mycotaxon* 14 (1): 125-139.

Onofri, S. 1984. Analisi micologica della littiera. *In*: Riess S., A. Rambelli, O. Maggi e S. Onofri. *Studi comparativi sui microfunghi in un agroecosistema a caffe*. Publicazione dell'istituto Italo-Latino Americano, Roma.

Persiani, A. M. and O. Maggi. 1988. Fungal communities in the rhizosphere of *Coffea arabica* L. in Mexico. *Mic. Ital.* 2: 21-37.

Petrini, O. and M. Dreyfuss. 1981. Endophytische plize in epiphytischen *Araceae, Bromeliaceae* and *Orchidaceae*. *Sydowia* 34: 135-148.

Pirozynski, K. A. 1972. Microfungi of Tanzania. I. Miscellaneous fungi on oil palm. II. New hyphomycetes. *Mycol. Pap*. 129: 1-65.

Pirozynski, K. A. and C. S. Hodges Jr. 1973. New Hyphomycetes from Sounth Carolina. *Can. J. Bot.* 51: 157-173.

Seifert, K. A. 1990. Synnematous Hyphomycetes. *Mem. N. Y. Bot. Gdn*. 59: 109-154.

Shearer, C. A., J. L. Crane and M. A. Miller. 1976. Illinois fungi 6. Two new species of wood-inhabiting hyphomycetes from freshwater. *Mycologia* 68: 184-189.

Sutton, B. C and K. A. Pirozynski. 1963. Notes on British microfungi. I. *Trans. Br. mycol. Soc*. 46 (4): 505-522.

Sutton, B. C. 1973. Hyphomycetes from Manitoba and Saskatchewan, Canada. *Mycol. Pap*. 132: 1-143.

Wang, C. J. K and G. E. Beker. 1967. *Zygosporium masonii* and *Z. echinosporum* from Hawaii. *Can. J. Bot*. 45: 1945-1952.

MYCOTAXON

Volume LXIV, pp. 225-228 September 1997

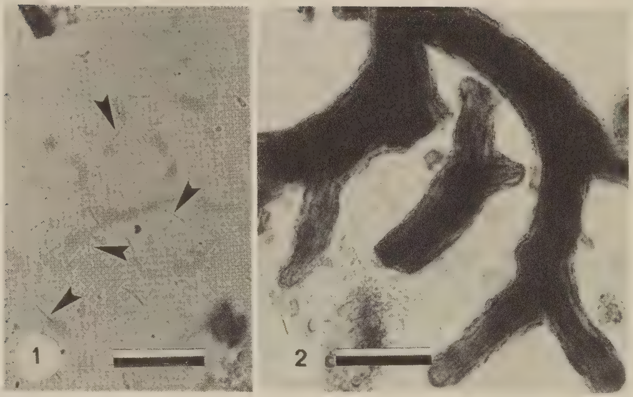
BULBOTHRICELLA AMAZONENSIS IS A POLYSPOROUS MEMBER OF BULBOTHRIX (PARMELIACEAE)

H. THORSTEN LUMBSCH

Botanisches Institut, Universität Essen, D-45117 Essen, Germany

Abstract: The genus *Bulbothricella* Marcano *et al.* has now been shown to have been based on the misinterpretation of several morphological characters. The conidia and rhizines are now shown to be of the same type as observed in the genus *Bulbothrix*. The originally described anamorph belongs to a lichenicolous fungus. Hence the genus *Bulbothricella* is reduced to synonymy with *Bulbothrix*.

The generic concepts in the Parmeliaceae are currently in a state of flux. A number of genera have been described on the basis of correlating morphological, anatomical, and chemical characters. A summary and discussion of this process is given by Elix (1993). The size and form of conidia has often been used to distinguish some genera, for example *Parmelia* and *Punctelia* (Krog, 1982). In this context the description of the Venezuelan genus *Bulbothricella* (Marcano *et al.*, 1996) was interesting since the authors described obovate conidia acrogenously formed in pycnidia with dark pigmented walls. Such anamorphs are not known from any other member of the Parmeliaceae, and would thus be an excellent autapomorphy of the genus. However, from the illustrations given in the original publication it appeared likely that the pycnidia examined belonged to a lichenicolous fungus rather than the lichen itself. Therefore the genus was reexamined and the results are presented below.



Figs 1-2. *Bulbothricella amazonensis*, isotype (B). *1.* Bacilliform conidia (arrows). *2.* Dichotomously branched rhizines. Scales=20 μm.

Material and Methods

Material. Two specimens of *Bulbothricella amazonensis* deposited in B were examined: Venezuela. Amazonas, Cerro Duida, 26.II.1994, *Galiz & Marcano AMA-56* (B, isotype); Alto Orinoco, Savanna of La Esmeralda, 65°33'W, 3°11'N, 150 m, *Jentzsch 10* (B).

Methods. Microscopy. Photomicrographs were taken on a Leica DM microscope fitted with Nomarski Differential Interference Contrast. - Chemistry. The chemical constituents were identified using gradient-elution high performance liquid chromatography, HPLC (Feige *et al.*, 1993).

Results and Discussion

The genus *Bulbothricella* was described as being closely related to *Bulbothrix* since both genera contain atranorin in the upper cortex, have a pored epicortex, bulbate cilia, coronate apothecia, ellipsoid ascospores, and contain medullary depsides. These characteristics were confirmed. In addition to gyrophoric acid and atranorin mentioned by Morales-Méndez *et al.* (1995) and Marcano *et al.* (1996), chloroatranorin, lecanoric acid, and orsellinic acid were detected as minor substances by HPLC, but no 2-*O*-methylgyrophoric acid (=umbilicaric acid) which was reported previously (Morales-Méndez *et al.*, 1995). *Bulbothricella* was segregated from *Bulbothrix* on the basis of differences in the anamorph and the furcate-branched rhizines.

The isotype specimen of *Bulbothricella amazonensis* is heavily infected by a lichenicolous fungus, visible as blackish colourations on the upper surface. The pycnidia described in the original description belong to that fungus, which probably belongs to the genus *Phoma*. The pycnidia of *Bulbothricella*, however, are immersed in the thallus and contain pleurogenously formed bacilliform conidia (Fig. 1). Bacilliform conidia are also known in *Bulbothrix* (Elix, 1993).

The rhizines of *Bulbothricella* were described as furcate-branched (Marcano *et al.*, 1996) or richly branched (Morales-Méndez *et al.*, 1995), while they were claimed as being simple to dichotomously branched in *Bulbothrix*. The rhizines in the type material of *Bulbothricella* are richly branched, but the branching pattern is strictly dichotomous (Fig. 2). Richly dichotomously branched rhizines are known from several *Bulbothrix* spp. (Hale, 1976). Indeed, a nice REM illustration of such rhizines is given by Hale (1976: 2).

Thus it is obvious that the main characters for distinguishing *Bulbothricella* and *Bulbothrix* were based on several misinterpretations. In particular, the conidia and rhizines are of the same type as in numerous *Bulbothrix* species. The only consistent difference between the two genera is the number of spores in the ascus. While *Bulbothricella* contains 12-14 spores, *Bulbothrix* has eight spores. However, species with polysporous asci are known in other genera in the Parmeliaceae, for example the closely related *Relicina* (Hale, 1975) and in *Melanelia* (Esslinger, 1977). Consequently, *Bulbothricella* can be reduced to synonymy with *Bulbothrix*. The correct name for the single species assigned to *Bulbothricella* is *Bulbothrix amazonensis* Marcano, Galiz & Morales.

Acknowledgements

I wish to thank Dr. H. Sipman (Berlin) for forwarding me the two *Bulbothricella* specimens on loan and to Prof. Dr. J.A. Elix (Canberra) for his helpful comments on this manuscript.

References

Elix, J. A. 1993. Progress in the generic delimitation of *Parmelia sensu lato* lichens (Ascomycotina: Parmeliaceae) and a synoptic key to the Parmeliaceae. Bryologist 96: 359-383.

Esslinger, T. L. 1977. A chemosystematic revision of the brown *Parmeliae*. J. Hattori Bot. Lab. 42: 1-211.

Feige, G. B., H. T. Lumbsch, S. Huneck & J. A. Elix. 1993. Identification of lichen substances by a standardized high-performance liquid chromatographic method. J. Chromatogr. 646: 417-427.

Hale, M. E., Jr. 1975. A monograph of the lichen genus *Relicina* (Parmeliaceae). Smiths. Contr. Bot. 26: 1-32.

---. 1976. A monograph of the lichen genus *Bulbothrix* Hale (Parmeliaceae). Smiths. Contr. Bot. 32: 1-29.

Krog, H. 1982. *Punctelia*, a new lichen genus in the Parmeliaceae. Nord. J. Bot. 2: 287-292.

Marcano, V., S. Mohali, E. Palacios-Prü & A. Morales Méndez. 1996. The lichen genus *Bulbothricella*, a new segregate in the Parmeliaceae from Venezuela. Lichenologist 28: 421-430.

Morales-Méndez, A., V. Marcano, L. Galiz, S. Mohali & E. Palacios-Prü. 1995. *Bulbothrix amazonensis* sp. nov., a new species of Parmeliaceae (Lecanorales) from Venezuelan Amazonia, pp. 281-286. *In* F. J. A. Daniels, M. Schulz and J. Peine (eds.), Flechten Follmann. Contributions to lichenology in Honour of Gerhard Follmann, Geobotanical and Phytotaxonomical Study Group, Botanical Institute, University of Cologne, Cologne.

MYCOTAXON

Volume LXIV, pp. 229-241 September 1997

CORTICIOID SPECIES (BASIDIOMYCOTINA, APHYLLOPHORALES) FROM COLOMBIA COLLECTED BY LEIF RYVARDEN

KURT HJORTSTAM
Målaregatan 12, S-441 35, Alingsås, Sweden
and
LEIF RYVARDEN
Department of Botany, University of Oslo, P.O. Box 1045,
Blindern, N-0316 Oslo, Norway

ABSTRACT

Botryohypochnus verrucisporus, *Lazulinospora wakefieldiae* and *Lindtneria chordulata* are reported for the first time from South America. The following new taxa are proposed: *Botryohypochnus scaberulus*, *Hyphodontia hastifer* (only known from Argentina), *Hyphodontia rudis*, *Hyphodontia stratosa* (typified with a specimen from Africa), and *Melzerodontia rasilis*. *Hyphodontia verecunda* is proposed as a new combination with the basionym *Peniophora verecunda* G. Cunn., and the genus *Palifer* Stalpers and P.K. Buchanan is considered a synonym of *Hyphodontia*.

INTRODUCTION

In 1978 one of us (LR) had the opportunity to participate in a mycological expedition to Colombia together with F. Oberwinkler (University of Tübingen, Germany), K. Dumont (then New York Botanical Garden, now in private enterprise) and P. Buritica, (University of Bogota, Colombia).

Some poroid species based on collections made by LR are reported in Setliff & Ryvarden (1983) and the genus *Tomentellago* Hjortst. & Ryv. was based on material collected in 1978 from Colombia (see Hjortstam & Ryvarden 1988). Besides that, no results have been published although some scattered collections have been used by other mycologists. A complete review of mycological papers up to 1989, based on collections from the neotropics, can be found in Nishida 1989.

Since this is the first modern study of corticoid fungi from Colombia, it goes without saying that almost all the reported species are new for Colombia. The following list is based on only a third of the 1300 collections of corticoid fungi made in total. The remaining collections will be described in a later paper, the same applies to some apparently undescribed species of polypores. The numbers in the list are those of L. Ryvarden and all collections, unless stated otherwise, are deposited in the Göteborg University Herbarium (GB).

To avoid excessive citations of locality names, the following lists indicate where the cited collections were made.

Collections 15400-489, 15660-730, west of Bogota, 2700 m, 3, and 8. June.
C. 15490-621, 20 km west of Bogota, La Mesa, 2400 m, 4-6. June.
C. 15622-659, Summa Paz. 70 km S. of Bogota, 3700 m, 7. June
C. 15731-813, Magdalena prov., Santa Marta, 500 m, 12. June.

LIST OF SPECIES

Aleurocystis magnispora (Burt) Lemke
Specimen: 15573
Asterostroma muscicola (Berk. & M.A. Curtis) Massee
Specimens: 15411, 15552, 15567
Athelia* cfr. *decipiens (Höhn. & Litsch.) J. Erikss.
Specimen: 15505. On a leaf and referred to by Hjortstam and Larsson (1995).
A. epiphylla Pers. s.l.
Specimens: 15525, 15614. On leaves and with more narrowly shaped spores than normal.
Atelopsis lembospora (Bourdot) Oberw.
Specimen: 15649. A well known species, with a preference for ferns.
Botryobasidium lembosporum (D.P. Rogers) Donk
Specimens: 15531, 15542, 15589, 15544

BOTRYOHYPOCHNUS SCABERULUS Hjortstam & Ryvarden sp. nov. Fig. 1
Species haec ab Botryohypochno isabellino differt sporis scaberulis, 7 x 7.5 µm vel 7-7.5 µm diametro.

HOLOTYPUS: Colombia, Cundinamarcha, 6.VI. 1978, Ryvarden No.15500 (GB)
Etymology: *scaberulus* minutely scabrous.

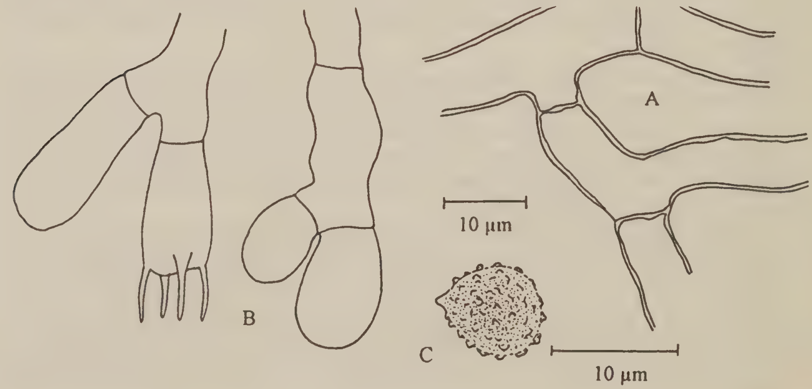


Fig. 1. **Botryohypochnus scaberulus** A) Hypha B) Basidia C) Spore. (LR. 15500).

BASIDIOME resupinate, loosely adnate, hypochnoid. HYMENOPHORE smooth, pale ochraceous to pale umber. HYPHAL SYSTEM monomitic; basal hyphae pale brown, thick-walled, ramified at right angles, 9-10 µm wide, with walls cyanophilous; subhymenial hyphae subhyaline to hyaline, slightly narrower and thin-walled, 8-10 µm wide. All hyphae without clamp-connexions. CYSTIDIA absent. BASIDIA stout, 15(-18) x 9-10 µm, with four or occasionally two sterigmata. SPORES globoid, thick-walled, uneven in outline or with small verrucae, but never aculeate, at first hyaline then pale yellowish and with a distinct apiculus, 7.5-7 µm or 7-7.5 µm diam., cyanophilous.
Remarks: A very distinctive species due to its slightly rugose spores with short verrucae. In all other characteristics very similar to *Botryohypochnus isabellinus* (Fr.) J. Erikss. (generic type).

Botryohypochnus isabellinus (Fr.) J. Erikss.
Specimens: 15571, 15618
B. verrucisporus Burds. & Gilb.
Specimen: 15757. New from South America and previously known only from the type locality. It has been combined into *Botryobasidium* by G. Langer (1994), but we follow Burdsall and Gilbertson´s (1982) disposition of the species and maintain the taxon in *Botryohypochnus*.

Key to species of Botryohypochnus

1. Spores navicular, verrucose, with 4-6 sterigmata **2**
1. Spores ± globoid in outline, echinulate, aculeate or verrucose, with (2-)4 sterigmata **3**
2. Basidia 18-24 x 12-15 µm with 2-6 sterigmata, spores 9-13 x 5-7 µm, indistinctly biapiculate with apical part not or slightly elongated. Gabon, Argentina, Brazil .... **hebelomatosporus**
2. Basidia 15-20 x 8-10 µm mainly with 4 sterigmata, spores 8-12 x 5-7 µm, distinctly biapiculate with an elongated apical part. Brazil .... **biapiculatus**
3. Spores verrucose **4**
3. Spores aculeate or echinulate **5**
4. Basidia about 15 µm long, spores globose, about 7 µm diam. Colombia. .... **scaberulus**
4. Basidia 25-30 µm long, broadly ellipsoid, 6-8 x 5-5.5 µm (original description). USA, Colombia .... **verrucisporus**
5. Basidia with two sterigmata. Reunion .... **bisporum**
5. Basidia generally with four sterigmata **6**
6. Spores regular i outline, densely echinulate, 7-8 µm diam. (excluding spines), spines 1-3 µm long. Cosmopolitan. Note *B. anomalus* Hjortstam which probably is a synonym of *B. isabellinus*. .... **isabellinus**
6. Spores irregular in outline, with few 2-4 µm long spines **7**
7. Spores 6.5-8.5 x 6-7 µm, aculei 3-4 µm long. Russia, Japan, USA and South America .... **bondarcevii**
7. Spores 4-6 x 4-5 µm, aculei about 5 µm long. Taiwan .... **Botryobasidium asterosporum**

Brevicellicium exile (H.S. Jacks.) K.H. Larss. & Hjortstam
Specimen: 15655
B. molle Hjortstam & Ryvarden
Specimen: 15539. The specimen was also reported by Hjortstam and Larsson (1995)
Byssomerulius corium (Fr.) Parmasto
Specimens: 15473, 15580=cfr.
Candelabrochaete dispar Hjortstam & Ryvarden
Specimen: 15792
Cylindrobasidium torrendii (Bres.) Hjortstam
Specimen: 15489. For comments of this species see Hjortstam and Larsson (1995).
Dendrophora* cfr. *albobadia (Schwein.:Fr.) Chamuris
Specimen: 15579=with shorter spores than normal.
Dendrothele cyatheae (S. Ito & Imai) N. Maek. cfr.
Specimens: on *Cyathea* 15437. On bamboo or palm-trees 15570=rather poor, 15584, 15656, 15711, 15714, 15717. On wood 15706. Also from southwestern Venezuela, Ciudad Bolivar, on wood, (Ryvarden No. 35217).

We have not seen authentic material of this species, but according to a drawing and description by Maekawa (1993) the Colombian specimens agree, but the spores are less navicular than those figured by Maekawa and may be slightly shorter. It should also be added that the spores as well as dendrohyphidia are in some specimens (probably old) slightly dextrinoid (brownish with a reddish tint).

D. cyatheae is a striking species and superficially similar to *Lepidomyces subcalceus* (Litsch.) Jülich, particularly in its lanceolate cystidia. It should also be compared with *Repetobasidiellum fusisporum* J. Erikss. & Hjortstam (Eriksson et al. 1981), but this species lacks cystidia and the basidia are not typically pedunculate and are probably repetitive. The latter species was described from Sweden (on ferns) and is well known on *Cyathea* and *Dicksonia* from South America, though not yet recorded from Colombia.

D.* cfr. *mexicana (Lemke) Lemke
Specimens: 15416, 15481, 15574/B. According to Lemke (1964) this species is common in Mexico. It is a robust species with very large basidia and spores (12-18 µm diam.), though the hyphae are narrow (1.5-2 µm) and apparently without clamp-connexions. Authentic material has not been studied by us.
Dentipellis dissita (Berk. & Cooke) Maas Geest.
Specimen: 15593/B. Originally described from Amazonas. This is very likely the second record from South America.
Dichostereum effuscatum (Cooke & Ellis) Boidin & Lanq.
Specimen: 15696. Previously known only from Argentina (Boidin and Lanquetin 1977).
Gloeodontia pyramidata (Berk. & M.A. Curtis) Hjortstam
Specimens: 15670, 15700
Hyphoderma argillaceum (Bres.) Donk
Specimens: 15651, 15653, 15763
H. heterocystidium Burt) Donk
Specimen: 15688
H. litschaueri (Burt) J. Erikss.
Specimen: 15588

H. pallidum (Bres.) Donk
Specimens: 15671, 15535=cfr.
H. praetermissum (P. Karst.) J. Erikss. & Strid
Specimen: 15713
H. puberum (Fr.) Wallr.
Specimen: 15545
***H. puberum*-group**
Specimen: 15805
Another specimen, 15751, is somewhat similar to *H. incrustatissimum* Boidin & Gilles, described from Reunion.
H. rude (Bres.) Hjortstam & Ryvarden
Specimen: 15609=probably this species.
H. setigerum (Fr.) Donk
Specimens: 15482, 15636, 15644
Hyphodermella corrugata (Fr.) J. Erikss. & Ryvarden
Specimens: 15568, 15602, 15611
Hyphodontia alutaria (Burt) J. Erikss.
Specimen: 15605
H. apacheriensis (Gilb. & Canf.) Hjortstam & Ryvarden
Specimen: 15764
H. brevidens (Pat.) Ryvarden
Specimens: 15680, 15702
H.* cfr. *breviseta (P. Karst.) J. Erikss.
Specimens: 15403, 15407, 15440. All are from bamboo.
H. candidissima (Berk. & M.A. Curtis) E. Langer
Specimen: 15654. On twigs. The determination is based on a specimen on a palm from Brazil (Hjm 16787, at Kew Herbarium under the name *Hyphodontia agglutinospora* Hjortstam ined.).

Kneiffia candidissima was originally described on *Juniperus virginiana* from S. Carolina, USA. However, the holotype (at Kew) is poor and microscopically rather structurless, but certainly represents a species of *Hyphodontia*. See further Gilbertson (1965) who also stated that the isotype (FH) was poorly preserved and E. Langer (1994) for a description and figure of the species based on Hjm 16787.
Hyphodontia* cfr. *crustosa (Pers.:Fr.) J. Erikss.
Specimens: 15554, 15658, 15737

A variable species, not only in South America. Typically it is strongly grandinioid, with rather small verrucae, whitish to more commonly yellowish and with a preference for growing mainly on decorticated, still attached branches. The spores are subcylindrical, 5-6.5 x 2.5-3 µm, which is of important significance.
In the first specimen the spores are ellipsoid, about 5x3 µm, otherwise as in typical *H. crustosa*. In the second specimen the spores are cylindrical, 6 x 2.2(-2.5) µm. The colour of the hymenophore and size of the spores in 15737 are about the same as in typical *H. crustosa*, but the hymenophore is almost smooth. See further *H. juniperi* and *H. stratosa*.

Key to species in the Hyphodontia crustosa-group

1. Hymenophore cream-coloured to somewhat greyish, smooth or rarely grandin ioid, spores broadly ellipsoid.. **juniperi**
1. Hymenophore cream-coloured to pale ochraceous, distinctly grandinioid to odontioid **2**
2. Spores subglobose, about 4.5 µm diam. or 4.5-5 x 3.8-4 µm ...... **crustosoglobosa**
2. Spores differently shaped **3**
3. Hymenophore commonly stratose and often glossy, grandinioid, spores broadly ellipsoid.. **stratosa**
3. Hymenophore not stratose, soft to rather hard, grandinioid to distinctly odontioid, spores narrowly ellipsoid to cylindrical .... **crustosa**

H detritica (Bourdot) J. Erikss.
Specimens: 15526/B, 15667

HYPHODONTIA HASTIFER Hjortstam & Ryvarden sp. nov.
Basidioma resupinatum, aliquantum laxum. Hymenophorum odontoideum; aculeis 3-5/mm, 0.5 mm longis, conicis, fimbriatis. Systema hyphae monomiticum; hyphis basalibus moderate crassitunicatis, 3-5(-6) µm latis, hyphis ceteris similaribus, omnino fibulatis. Cystidia 1) tenuitunicata, capitulata vel capitata 2) tenuitunicata, subulata, 40-60 x 6-8 µm. Basidia 20-25 x 4.5-5 µm, 4-sterigmatica; sporis subglobosis, levis, tenuitunicatis, 4.5-5 x 4-4.5 µm.

HOLOTYPUS: Argentina, Misiones, Iguazu national park, 1-5 March 1982, Ryvarden No. 19767 (K). Isotypus: GB. Paratypus: ditto Ryvarden No. 19819 (K, GB).
Etymology: *hastifer* spear-bearing.

BASIDIOME resupinate, rather loose. HYMENOPHORE distinctly odontioid, whitish, aculei small, less than 0.5 mm, 3-5/mm, conical with the apical part fimbriate. HYPHAL SYSTEM monomitic; basal hyphae rather robust, moderately thick-walled, 3-5(-6) µm wide, often strongly encrusted and forming a thin subiculum, subhymenial hyphae less encrusted, 3-5 µm wide, ultimate hyphae in the aculei obtuse, all hyphae with clamp-connexions. CYSTIDIA of two kinds 1) thin-walled, capitulate to capitate and rather few 2) subulate (hastocystidia), thin-walled, 40-60 µm long and 6-8 µm wide in the middle part. BASIDIA suburniform, constricted, 20-25 x 4.5-5 µm, with four sterigmata and a basal clamp-connexion. SPORES subglobose, smooth, thin-walled, 4.5-5 x 4-4.5 µm, inamyloid and acyanophilous.

REMARKS. E. Langer (1994) gave a full description and a good illustration of this species, but he did not provide a Latin diagnosis, consequently it has to be validly described. *Hyphodontia hastifer* is somewhat reminiscent of *H. breviseta* (P. Karst.) J. Erikss., but can readily be separated by two kinds of cystidia, capitulate and subulate, and by slightly smaller spores. Also the hymenial configuration, with rather small aculei, is a good distinguishing characteristic. The species has not been found outside Argentina.

H. juniperi (Bourdot & Galzin) J. Erikss.
Specimen: 15739
This species is usually easily recognized and well separated from *H. crustosa* by its yellowish, white or sometimes greyish and almost smooth hymenophore and ellipsoid spores (4.5-6 x 3-4 µm). *H. crustosa* has cylindric spores and the hymenophore is grandinioid to odontoid.

HYPHODONTIA RUDIS Hjortstam & Ryvarden sp. nov.
Basidioma resupinatum, effusum, arte adnatum. Hymenophorum odontoides, rimosum aculeis 5-6/mm, 0.2-0.3 mm longis, apicaliter fimbriatis. Systema hyphale monomiticum vel subdimiticum; hyphis skeleticis crassitunicatis, 2.5-3 µm latis, ut videtur fibulis nullis, hyphis ceteris fibulatis, tenuitunicatis vel crassiusculis, circiter 3 µm latis. Cystidia nulla. Basidia 25-30 x 4.5-5 µm, 4- sterigmatica; sporis subglobosis vel ellipsoideis, levibus, circiter 5 x 4 µm.

HOLOTYPUS: Colombia, Cundinamarcha, 2300 m.a.s.l., 6.VI.1978, Ryvarden No. 15612 (GB). Isotypus: (K,O). Paratypi: Colombia, Cundinamarcha, 2300 m.a.s.l., 3.VI. 1978, Ryvarden No. 15429, 6.VI.1978, No. 15496 and 7.VI.1978, No. 15622.
Ryvarden No. 15429 differs by smaller and nearly smooth, not crowded aculei, but conforms in other characteristics.
Etymology: *rudis* uneven, rough.

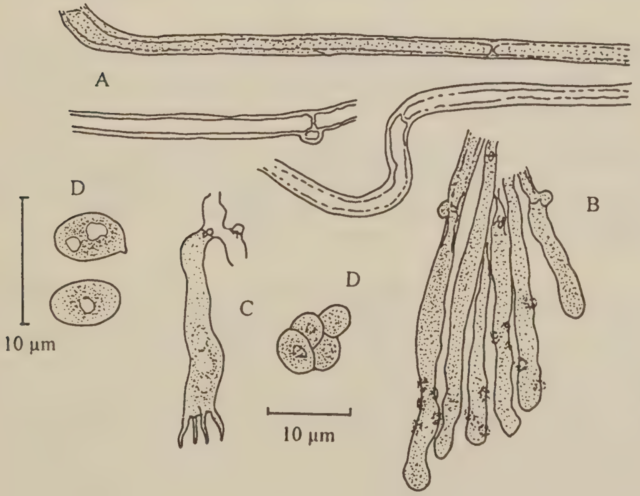


Fig. 2. **Hyphodontia rudis** A) Skeletal hyphae B) Aculeal hyphae C) Basidium D) Spores. (LR. 15612).

BASIDIOME resupinate, closely adnate, widely distributed on the substrate. HYMENOPHORE odontoid, rimose, pale ochraceous, aculei crowded and provided with small outgrowths, 5-6/mm, 0.2-0.3 mm long and apically somewhat fimbriate. SUBICULUM distinct, 0.3-0.5 mm thick, paler than the aculeal part. MARGIN often revolute, fimbrillate. HYPHAL SYSTEM monomitic or subdimitic; subicular hyphae rather straight, moderately to distinctly thick-walled, 2.5-3 µm wide, densely interwoven; skeletal hyphae can be found in the central part of the aculei, less or absent in the subiculum, thick-walled, hyaline but strongly light-refracting, 2.5-3 µm wide, seemingly without clamp-connexions or only at long intervals, other hyphae with clamp-connexions, moderately to distinctly thick-walled, about 3 µm wide, in the apical part of the aculei usually encrusted, subhymenial hyphae thin-walled, comparatively short-celled. CYSTIDIA absent, but aculeal hyphae ends now and then slightly capitate. BASIDIA thin-walled, sinuous or waisted, 25-30 x 4.5-5 µm, with four sterigmata and a basal clamp-connexion. SPORES ellipsoid, smooth, in KOH with a slight wall thickening, but in both Melzer´s reagent and Cotton-blue with thin walls, about 5 x 4 µm, inamyloid, indextrinoid and acyanophilous.

REMARKS. *Hyphodontia rudis* is a striking species and should be recognized by its odontoid and cracking hymenophore with relatively small and dense aculei. The skeletal hyphae are easily observed in the centre of the aculei, while they are seemingly absent or rarer in the subiculum. Additionally, the species lacks cystidia, which is unusual in the genus and the spores are somewhat thick-walled in KOH. The new species could be compared with *Schizopora paradoxa* (Schrad.: Fr.) Donk which is also subdimitic, but has capitate cystidia and different spores.

HYPHODONTIA STRATOSA Hjortstam & Ryvarden sp. nov.
Species haec ab Hyphodontia juniperi differt hymenophoro distincto verruculoso, nitido. Cystidia abundantes, sinuosa, circiter 30-40 µm. Basidia 20-25(-30) x (3.5-) 4 µm, 4 sterigmata, sporis ellipsoideis, levibus, 5.5-6 x 3.5-4 µm.

HOLOTYPUS: Africa, Kenya, Ryvarden No. 9798 (K). Isotypus: (GB)
Paratypi: Africa, Ethiopia, 8.IX. 1973 Ryvarden s.n. Tanzania, Ryvarden No. 10025 (K;GB). Colombia, Cundinamarcha, 3.VI. 1978, Ryvarden No. 15701 (GB).
Etymology: *stratosa* in layers.

BASIDIOME resupinate, effuse, closely adnate, when well developed somewhat stratose. HYMENOPHORE more or less glossy, partly smooth or more commonly grandinioid or odontoid and then with short aculei 4-6/mm, rather hard in consistency, yellowish to ochraceous. SUBICULUM distinct, whitish to chalky, 0.2-1 mm thick, with lots of crystalline deposits. MARGIN usually not well differentiated, but abrupt and paler in the type. HYPHAL SYSTEM monomitic; subicular hyphae in a dense layer, thin-walled or with slight wall thickening, 2.5-3 µm wide, encrusted; subhymenial hyphae comparatively short-celled, 2-2.5 µm wide. CYSTIDIA abundant, subulate, sinuose, projecting, normally 30-40 µm long. Basidia subclavate, often with a median constriction, at least occasionally with linear repetition, 20-25-(30) x (3.5-) 4 µm, with four sterigmata and a basal clamp-connexion. SPORES ellipsoid, smooth, 5.5-6 x 3.5-4 µm, inamyloid, indextrinoid and acyanophilous.

REMARKS. E. Langer (1994) placed this undescribed species in synonymy with

Hyphodontia juniperi. However, although *H. stratosa* is similar in spore-size, it is clearly separated by its distinctly grandinioid and more glossy hymenophore. *H. juniperi* is initially somewhat grey though later in development dull yellow and with a smooth or slightly tuberculate hymenophore.

HYPHODONTIA VERECUNDA (G. Cunn.) Hjortstam & Ryvarden comb. nov.
Basionym: *Peniophora verecunda* G. Cunn. Trans. R. Soc. New Zeal. 83: 262. 1955
Holotype: New Zealand, Taupo, March 1953 J.M. Dingley (PDD 12513).
Syn.: *Palifer verecundus* (G. Cunn.) Stalpers & P.K. Buchanan New Zeal. J. Bot. 29: 339. 1991.
Specimen: 15672

The following description is based on the Colombian specimen:
BASIDIOME resupinate, effuse, thin and rather loosely adnate. HYMENOPHORE smooth or slightly grandinioid when well developed, with alutaceous colour. HYPHAL SYSTEM monomitic; subiculum very thin, consisting of loosely arranged hyphae, thin-walled or with thickened walls, 3-5 µm wide, all hyphae with clamp-connexions. CYSTIDIA of three kinds; 1) short and capitate, thin-walled, 20-30 µm long, rare and with a subhymenial development, 2) lagenocystidia abundant, 20-30 µm long, obtuse or tapering towards the apex, thin-walled, but apically strongly encrusted, mainly subhymenial, 3) 100-150 µm long, cylindrical and apically obtuse or sometimes capitulate, mainly of subicular origin, thin-walled or basally with a slight wall thickening and about 5-7 µm wide in the middle part. BASIDIA 20-25(-30) µm long and 4(-5) µm wide, with four sterigmata and a basal clamp-connexion. SPORES ellipsoid, thin-walled, smooth, about 5 x 3 µm.

REMARKS. This species should be placed in the vicinity of *Hyphodontia pallidula*. Both spores and cystidia are comparable with others in this group (*alutaria*, *arguta*, and *pallidula)*. The long and cylindrical cystidia are, however, never septate in *H. verecunda*.
It should be noted that this species was described from just one specimen and this is rather young and thin, not showing the hymenial verrucae.
Consequently, the genus *Palifer* Stalpers & P.K. Buchanan with the generic type *Peniophora verecunda* G. Cunn., is a synonym of *Hyphodontia* J. Erikss.

Hyphodontia wrightii Hjortstam & Ryvarden
Specimens: 15603, 15626=poor, 15655/B
Lazulinospora wakefieldiae Burds. & M.J. Larsen
Specimen: 15768. Previously known only from the type locality (USA, Florida). The specimen is somewhat poor, but thanks to the clampless hyphae and warted spores with a distinct bluish reaction in KOH, easily determined.
Kõljalg (1996) placed this species in *Amaurodon* J. Schröt. typified with *Hydnum viride* Alb. & Schwein.: Fr., but we prefer to maintain the genus *Lazulinospora* and consider *Amaurodon* as a synonym of *Tomentella* [*Amaurodon viridis* (Alb. & Schwein.:Fr.) J. Schröt. = *Tomentella chlorina* (Massee) G. Cunn.]
Lindtneria chordulata (D.P. Rogers) Hjortstam
Specimens: 15741=scarce material, 15756=clamps not observed, 15762.
Previously not reported from South America, but a well known species, particularly

from subtropical and tropical areas.
Litschauerella clematitis (Bourdot & Galzin) J. Erikss. & Ryvarden
Specimens: 15556, 15619

MELZERODONTIA RASILIS Hjortstam & Ryvarden sp. nov.
Melzerodontia aculeata aemulans, differt hymenophoro fere levi et cystidiis dispersis. Sporae 4.5-5 x 2.5-3 (-3.2) µm.
HOLOTYPUS: Colombia, Cundinamarcha, 6.VI. 1978, Ryvarden No.15495 (GB)
Etymology: *rasilis* shaved

BASIDIOME resupinate, effuse, closely adnate, brittle, 0.2-0.3 mm thick. HYMENOPHORE almost smooth or with scattered and minute warts, slightly cracked, pale brown. HYPHAL SYSTEM monomitic: subicular hyphae distinct, more or less vertically arranged in a dense layer, thin-walled, indextrinoid and acyanophilous, 2-2.5 µm wide, subhymenial hyphae thick-walled or with a slight wall thickening, 2-3 µm wide, all hyphae without clamp-connexions. CYSTIDIA very few, and absent in most preparation, tubular, thin-walled, projecting as much as 10-20 µm above the basidia, 30-40 µm long and 5-6 µm wide in the middle part, negative in sulphovanillin. Hyphal ends scattered, narrow, lanceolate. BASIDIA subclavate, thick-walled towards the base, with four sterigmata and without a basal clamp-connexion. BASIDIAL AND SUBHYMENIAL layers cyanophilous and with a weak but distinct dextrinoid reaction. SPORES ellipsoid, smooth, thin-walled, 4.5-5 x 2.5-3 (-3.2) µm, inamyloid, indextrinoid and acyanophilous.

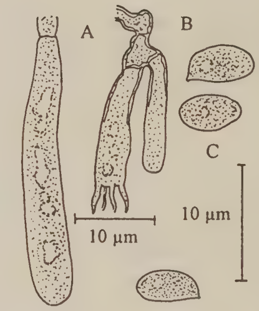


Fig. 3.**Melzerodontia rasilis** A) Cystidium B) Basidium C) Spores (LR. 15495). At the bottom a single spore of *Melzerodontia aculeata*. (From the holotype).

REMARKS. Microscopically similar to *Melzerodontia aculeata* Hjortstam & Ryvarden, which was described from Africa (Tanzania), but the spores are slightly wider. It should be noted that the spores in *M. aculeata* are shorter than given in the original description (Hjortstam and Ryvarden 1980). In a re-examination of the type they measured (4.2-)4.5-5 x 2.2-2.5 µm. *Melzerodontia rasilis* should be easily separated from the African species by its nearly smooth hymenophore, slightly narrower spores and occurrence of scattered cystidia.
Odonticium helgae Hjortstam & Ryvarden
Specimen: 15742. An uncommon species, known only from Europe and South America.
Peniophora* cfr. *confusa C.E. Gomez
Specimen: 15446. Apparently this species. It is previously known only from the type locality.

Hymenophore greyish, clamp-connexions absent, gloeocystidia few, probably negative in sulphovanillin, spores 7-8 x 2.5-3 µm. In the original description the species was described as "griseo-rubella vel griseo-violacea".

Phanerochaete exilis (Burt) Burds.

Specimen: 15506. With a rather robust basidiome, 0.3-0.5 µm thick. According to Rajchenberg and Wright (1987), *P. incrustans* (Speg.) Rajchenb. & Wright is similar, but has wider cystidia.

P. sanguinea (Fr.) Pouzar

Specimen: 15536

Phlebia* cfr. *coccineofulva Schwein.

With ochraceous hymenophore and spores 5-6 x 2.5-3 µm.

Specimen: 15780

P. lividina Hjortstam

Specimens: 15558, 15562, 15594

P. rufa (Pers.:Fr.) M.P. Christ.

Specimen: 15600

P.* cfr. *subcretacea (Litsch.) M.P. Christ.

Specimen: 15628. Basidiome with a horny texture, with somewhat narrower spores, 1.2-1.3 µm wide.

Phlebiella californica (Liberta) K.H. Larss. & Hjortstam

Specimen: 15648. On palm.

P. tulasnelloidea (Höhn. & Litsch.) Oberw.

Specimen: 15669

P.* cfr. *vaga (Fr.) P. Karst.

Specimen: 15582. Differs from typical *P. vaga* by its brown hymenophore.

Porostereum crassum (Lév.) Hjortstam & Ryvarden

Specimen: 15790. Presumably this species.

Radulomyces confluens (Fr.:Fr.) M.P. Christ.

Specimens: 15423, 15675. A well known species with a world-wide distribution, though variable as to its spore-size.

R. rickii (Bres.) M.P. Christ.

Specimen: 15409

A misinterpreted species. Eriksson et al. (1981) were of the opinion that it possibly represents an extreme form of *Radulomyces confluens*. Hjortstam and Ryvarden (1986) designated a lectotype of the species (*Corticium rickii* Bres. in Rick) and synonymized it with *R. confluens*. Later Boidin et al. (1988) proved that *Corticium rickii* was a species of its own, separated by slightly rugose spores. They also proposed a new combination for it in *Cerocorticium* Jülich. We are following Boidin et al. and accept the taxon, but still we believe that it should be kept in *Radulomyces*. For further information about the latter genus see Hjortstam (1983).

Radulomyces rickii was first reported by Rick (1928) from Brazil, but we have not seen any of his collections. Hjortstam and Larsson (1995) reported the specimens cited below as *Radulomyces fuscus*, but a re-examination revealed them to be *R. rickii*. The spore-ornamentation is rather easy to observe in Melzer´s reagent, but subinvisible or invisible in KOH and Cotton-blue. It should be noted that the species has also been collected in Brazil by Hjortstam (No. 16665) and Ryvarden (No. 24409), both from Sao Paulo, Campinas, Mogi Guaçu, 1987.

Repetobasidium mirificum J. Erikss.
Specimens: 15647, 15655/C
Schizopora flavipora (Cooke) Ryvarden
Specimen: 15598
Scytinostroma portentosum (Berk. & M.A. Curtis) Donk
Specimens: 15753, 15740=few spores seen
Sistotrema brinkmannii (Bres.) J. Erikss.
Specimen: 15433. An almost smooth form.
S. diademiferum (Bourdot & Galzin) Donk
Specimen: 15436/B and also with a species of *Cerinomyces.*
S. raduloides (P. Karst.) Donk
Specimen: 15613
Sistotremastrum niveocremeum (Höhn. & Litsch.) J. Erikss.
Specimen: 15633
Sistotremella perpusilla
Specimen: 15617. On a species of *Hymenochaete* and also mixed with *Botryobasidium.*
Steccherinum albo-fibrillosum (Hjortstam & Ryvarden) Hallenb. & Hjortstam
Specimens: 15435, 15436, 15438
S.* cfr. *ciliolatum (Berk. & M.A. Curtis) Gilb. & Budington
Specimen: 15422
S.* cfr. *laeticolor (Berk. & M.A. Curtis) Banker
Specimen: 15595
S. ochraceum (Pers.:Fr.) S.F. Gray
Specimens: 15615, 15620
S. subochraceum Bononi & Hjortstam
Specimen: 15442
Stereum complicatum (Fr.) Fr.
Specimen: 15599
S. ostrea (Blume:Fr.) Fr.
Specimen: 15432
Subulicystidium longispora (Pat.) Parmasto
Specimens: 15483, 15736, 15743, 15744/B, 15755, 15774, 15784, 15791, 15798.
All specimens variable with different kind of spores.
Thanatephorus cucumeris (A.B. Frank) Donk
Specimen: 15715. A minute specimen on an unidentified plant.
Trechispora farinacea (Pers.:Fr.) Liberta
Specimens: 15666, 15766, 15794=in termite nest.
T. nivea (Pers.:Fr.) K.H. Larss.
15465, 15526, 15593, 15689
T. stevensonii (Berk. & Broome) K.H. Larss.
Specimen: 15591. See further Larsson(1995).
Tubulicrinis hamatus (H.S. Jacks.) Donk
Specimen: 15642
Xenasma aculeatum C.E. Gomez
Specimen: 15474
Xenasma pulverulentum (Litsch.) Donk
Specimen: 15494

Xenasma rimicola (P. Karst.) Donk
Specimens: 15406, 15413, 15532, 15540

REFERENCES

Boidin, J. and Lanquetin, P. 1977. Les genres *Dichostereum* et *Vararia* en Guadeloupe (Basidiomycetes Lachnocladiaceae). Mycotaxon 6:277-336.

Boidin, J., Gilles, G. and Hugueney, R. 1988. Rehabilitation du *Corticium rickii* Bres. (Basidiomycotina). Crypotog.Mycol.9:43-46.

Burdsall, H.H. and Gilbertson, R.L. 1982. New species of Corticiaceae (Basidiomycotina, Aphyllophorales) from Arizona. Mycotaxon 15:33-340

Eriksson, J., Hjortstam, K. and Ryvarden, L. 1981. The Corticiaceae of North Europe, Vol.6. *Phlebia-Sarcodontia.*Fungiflora, Oslo, Norway.

Gilbertson, R.L. 1965. Resupinate Hydnaceous Fungi of North America V. Type studies of species described by Berkeley and Curtis. Mycologia 57:845-871.

Hjortstam, K. 1983. Studies in tropical Corticiaceae (Basidiomycetes). V. Specimens from East Africa, collected by Leif Ryvarden. Mycotaxon 17:555-572.

Hjortstam, K. and Larsson, K.H. 1995. Annotated check-list to genera and species of corticioid fungi (Aphyllophorales, basidiomycotina) with special regards to tropical and subtropical species. Windahlia Journal of Mycology 21:1-75

Hjortstam, K. and Ryvarden, L. 1980. Studies in tropical Corticiaceae (Basidiomycetes). II. Mycotaxon 12:168-184.

Hjortstam, K. and Ryvarden, L. 1986. Some new and noteworthy fungi (Aphyllophorales, Basidiomycetes) from Iguazu, Argentina. Mycotaxon 25:539-567.

Hjortstam, K. and Ryvarden, L. 1988. *Tomentellago* gen. nov. (Thelephoraceae, Basidiomycetes) Mycotaxon 31:39-43

Kõljalg, U. 1996. *Tomentella* (Basidiomycota) and related genera in temperate Eurasia Synopsis Fungorum 9, 213 pp. Fungiflora, Oslo, Norway

Langer, E.1994. Die Gattung *Hyphodontia* John Eriksson. Bibl.Mycol. 154:1-298.

Langer, G. 1994. Die Gattung *Botryobasidium* Donk (Corticiaceae, Basidiomycetes). Bibl. Mycol. 158:1-459.

Larsson, K.H. 1995. Taxonomy of *Trechispora farinacea* and proposed synonyms I. Species with a grandinioid or hydnoid hymenophore Symb. bot. ups. 30(3):101-118

Lemke, P.A. 1964. The genus *Aleurodiscus* (sensu lato) in North America. Can. Journ. Bot. 42:723-768.

Maekawa, N. 1993. Taxonomic study of Japanese Corticiaceae (Aphyllophorales) I. Rept. Tottori. Mycol. Inst. 31:1-149.

Nishida, F.H. 1989. Review of mycological studies in the Neotropics. p. 494-522, in D. Campbell & D. H. Hammond (eds.): Floristic inventory of tropical countries. New York Bot. Garden.

Nuñez, M. & Ryvarden, L. 1996. *Aleurodiscus* s. lato. Synop. Fung. 11. In press.

Rajchenberg, M. and Wright, J.E. 1987. Type studies of Corticiaceae and Polyporaceae (Aphyllophorales) described by C. Spegazzini. Mycologia 79:246-264.

Rick, J. 1928. Resumo mycologico Egatea (Porto Alegre) 13:432-439

Setliff, E.C. and Ryvarden, L. 1983. Los hongos de Colombia VII. Some Aphyllophoraceous wood-inhabiting fungi. Mycotaxon 18:509-525.

MYCOTAXON

Volume LXIV, pp. 243-259 September 1997

MACROFUNGUS FLORA OF THE LAGOON OF VENICE AND ADJACENT AREAS (ITALY). NON-GILLED BASIDIOMYCETES. I. TOMENTELLOID FUNGI

Cristiano Losi
Civic Museum of Natural History, S. Croce 1730,
30121 - Venice, Italy *

ABSTRACT: 17 species of tomentelloid fungi distributed into 5 genera are reported from the Lagoon of Venice and adjacent areas. Most of them are fully illustrated and described; habitat and distribution are also given.

This paper draws its inspiration from the current project, started in 1987, undertaking a macrofungus map of the Lagoon of Venice and adjacent areas (Bersan et al., 1994). The study area includes the islands (total surface 4.360 ha) comprised in the salt basin between the mouths of the Brenta and Sile rivers, the near inland and sandy litorals. The most representative vegetation of each locality is briefly recorded in the list of localities. The mean temperature for winter is 4.2°C, for spring 13.4°C, for summer 23.7°C, for autumn 15.1°C. The mean annual relative humidity is 79% and the precipitation exceeds 800 mm per annum. All the collections were done by the author and the number of findings is given in brackets after the location distribution reference, which also appears after the herbarium number. The specimens are deposited in the author's private herbarium and in MCVE. The terminology of the shape and ornamentation of the basidiospores follows that of Larsen (1967); if not specified otherwise, the measurements of the basidiospores must be considered exclusive of ornamentation.

List of the localities the position of which can be found on the map (Fig. 1).

01 Asseggiano Wood (*Quercus pedunculata* Ehrh., *Carpinus betulus* L., *Ulmus campestris* L., *Fraxinus ornus* L., *Populus tremula* L., *Robinia pseudoacacia* L.)
02 Carpenedo Wood (vegetation as in Asseggiano)
03 Ca'Noghera Wood (vegetation as in Asseggiano)
04 Mestre (public parks and gardens with various deciduous and coniferous trees)

---

* Correspondence to: Cannaregio 3608, 30121 - Venice, Italy.

05 Valle Averto a wetland (*Ulmus campestris* L., *Robinia pseudoacacia* L., *Tamarix gallica* L., *Fraxinus excelsior* L., *Populus tremula* L., *P. nigra* L., *Salix alba* L., *S. caprea* L., *S. viminalis* L., *Sambucus nigra* L.)

06 Reclaimed land Cassa di colmata B (*Salix alba* L., *Populus tremula* L., *Robinia pseudoacacia* L., *Alnus glutinosa* (L.) Gaertn.)

07 Certosa Island (*Populus tremula* L., *Robinia pseudoacacia* L., *Tamarix gallica* L., *Morus nigra* L.)

08 Caroman Wood (*Populus tremula* L., *P. alba* L., *Elaeagnus angustifolia* L., *Robinia pseudoacacia* L., *Tamarix gallica* L., *Pinus pinea* L., *P. pinaster* Ait., *P.halepensis* Mill.)

09 Alberoni Wood (*Populus tremula* L., *P. alba* L., *Robinia pseudoacacia* L., *Pinus pinea* L., *Pinus pinaster* Ait.)

10 S. Nicolò Wood (vegetation as in Alberoni)

11 Ca' Savio Wood (*Alnus glutinosa* (L.) Gaertn., *Populus tremula* L., *P. alba* L., *Robinia pseudoacacia* L., *Elaeagnus angustifolia* L., *Tamarix gallica* L., *Pinus pinea* L., *P. pinaster* Ait.)

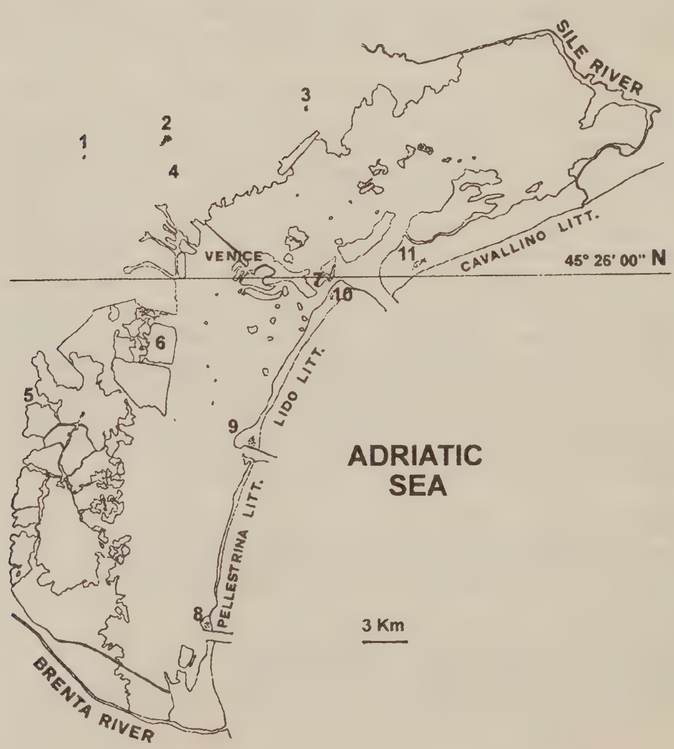
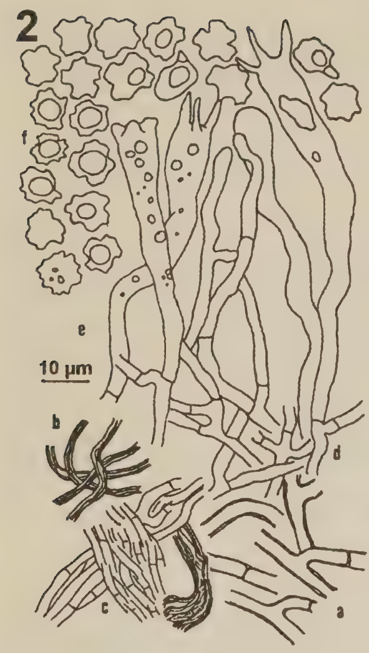

SILE RIVER
3
2
1
4
VENICE
11
CAVALLINO LITT.
45° 26' 00" N
7
10
6
5
LIDO LITT.
9
ADRIATIC SEA
PELLESTRINA LITT.
8
3 Km
BRENTA RIVER

Fig. 1. Map of the localities.



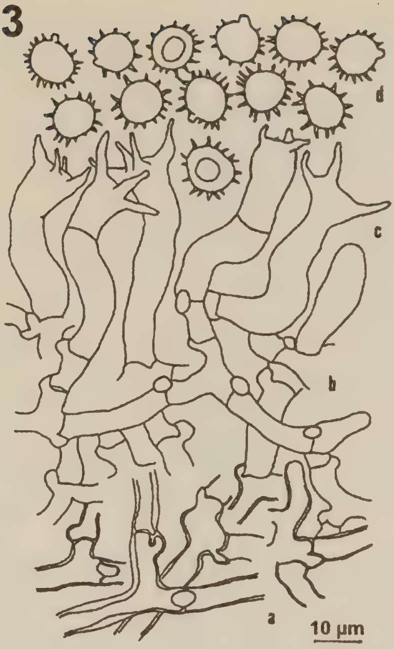


Fig. 2. *Pseudotomentella ca. fumosa*. a) subicular generative hyphae; b) skeletal hyphae; c) hyphal cords; d) subhymenial hyphae; e) basidia; f) basidiospores. **Fig. 3.** *Tomentella bryophila*. a) subicular hyphae; b) subhymenial hyphae; c) basidia; d) basidiospores.

Pseudotomentella ca. ***fumosa*** M.J.Larsen. Fig. 2.

BASIDIOME effused, adnate, separable, hypochnoid to membranous, not drying parchment-like. HYMENIAL SURFACE grey to greyish brown, smooth; margin not differentiated or paler and fibrillose to byssoid. SUBICULUM ± concolorous with the fertile area.

HYPHAL SYSTEM dimitic: generative hyphae simple-septate. SUBICULAR GENERATIVE HYPHAE subhyaline to dark reddish brown, 2-4 (-4.8) µm in diam., regular in outline, slightly thick-walled, rarely with granular encrusting material. SKELETAL HYPHAE numerous, citrine to pale brown, 1.2-1.6 (-2) µm in diam., thick-walled. HYPHAL CORDS frequent, up to 20 µm wide, composed of generative or more often of generative and skeletal hyphae. SUBHYMENIAL HYPHAE hyaline to very light brown but sometimes with ± homogenous dark brown contents which become greenish in KOH, (1.6-) 2.2-4 µm in diam., regular in outline, thin-walled. BASIDIA clavate, stalked, ± sinuous, 64-90 x 7.2-11 µm, 4-sterigmate, hyaline, often with brownish contents frequently greenish in KOH. BASIDIOSPORES subhyaline to pale brown, some greenish in KOH, lobed rarely irregularly globose or slightly elongated along one axis, warted with usually bifurcate warts, (7.2-) 8-9.6 (-11) µm across (warts included). No reaction in hyphae, basidia or basidiospores with Melzer's reagent.

HABITAT: on *A. glutinosa*. DISTRIBUTION: 11 (1).

VOUCHER SPECIMEN: private herbarium 1203 and MCVE 623, 11, 26.XI.95, on *A. glutinosa*.

REMARKS: Larsen (1971, 1974 and 1983) described five somewhat similar species: *P. griseopergamacea*, *P. griseoveneta*, *P. molybdea*, *P. fumosa* and *P. kaniksuensis*; these furthermore agree in some respects with *P. flavovirens* (Höhnel & Litsch.) Svrcek. On the other hand Stalp. (1993) considers *P. griseoveneta*, *P. molybdea* and *P. fumosa* probable synonyms of *P. griseopergamacea* and *P. kaniksuensis* very close to *P. flavovirens*. More recently Koljalg (1995) lists *P. griseoveneta*, *P. fumosa* and *P. kaniksuensis* as synonyms of *P. flavovirens* and *P. molybdea* as synonym of *P. griseopergamacea*; moreover, according to Koljalg, *P. flavovirens* differs from *P. griseopergamacea* only in the length and contents of basidia. The specimen in question is characterized by the greyish hymenial tints, long basidia often with rather abundant contents, slightly larger basidiospores.

Tomentella bryophila (Pers.) M.J.Larsen. Fig. 3.

BASIDIOME effused, adnate, ± separable, farinose to hypochnoid. HYMENIAL SURFACE umber yellow to ferruginous or reddish brown, smooth or with scattered semiglobose papillae; margin not especially differentiated or fibrillose, concolorous or darker. SUBICULUM darker than the fertile area.

HYPHAL SYSTEM monomitic: hyphae nodose-septate. SUBICULAR HYPHAE brown mostly with violaceous or olivaceous tints, 4-7 µm in diam., rather uniform in outline, thick-walled. SUBHYMENIAL HYPHAE yellowish to yellowish brown, 3.5-7 µm in diam., thin-walled. BASIDIA utriform, 40-55 x 8.5-10.5 µm, 4-sterigmate, hyaline to pale yellowish. BASIDIOSPORES yellowish to yellowish brown, globose to somewhat irregularly globose or slightly elongated along one axis, echinulate-aculeate to aculeate, 7-10.5 µm across.

HABITAT: on deciduous trees and burnt wood of *Pinus sp*. DISTRIBUTION: 1 (1), 9 (1), 10 (1), 11 (1).

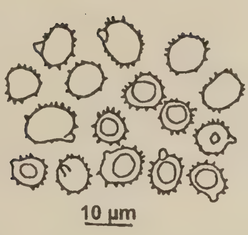
VOUCHER SPECIMENS: private herbarium 180, 10, 14.XI.93, on burnt wood of *Pinus sp.*; 212, 1, 23.X.93, on *Q. pedunculata*; MCVE 629, 9, 4.VI.95, on *R. pseudoacacia*; 11449, 11, 17.IV.94, on *A. glutinosa*.

Tomentella ellisii (Sacc.) Jül. & Stalp. Fig. 4.

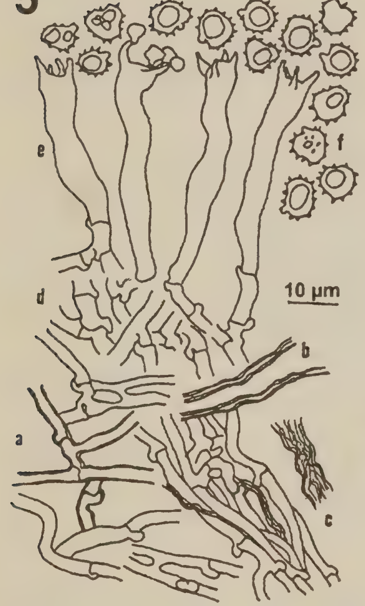
Syn.: *Tomentella ochracea* (Sacc.) M.J.Larsen.

BASIDIOME effused, adnate, adherent, hypochnoid to felty. HYMENIAL SURFACE medium to dark brown, smooth; margin paler, whitish to light brown, filamentose-fimbriate. SUBICULUM concolorous with or paler than the fertile area.

4



5



6

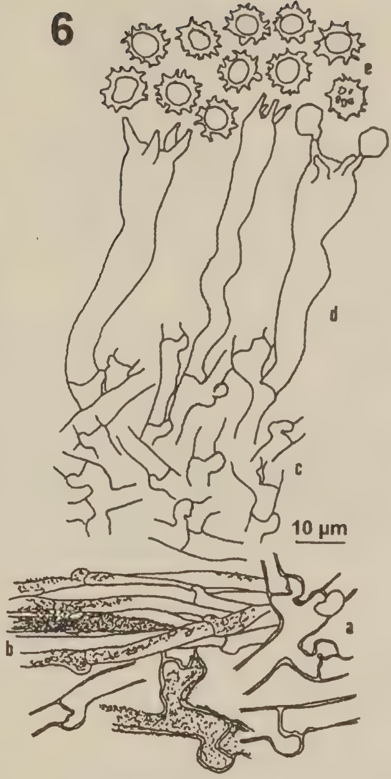


Fig. 4. *Tomentella ellisii*. Basidiospores. **Fig. 5.** *Tomentella ferruginea*. a) subicular generative hyphae; b) skeletal hyphae; c) hyphal cords; d) subhymenial hyphae; e) basidia; f) basidiospores. **Fig. 6.** *Tomentella italica*. a) subicular hyphae; b) hyphal cords; c) subhymenial hyphae; d) basidia; e) basidiospores.

HYPHAL SYSTEM monomitic: hyphae nodose-septate. SUBICULAR HYPHAE hyaline to pale brown, 3.5-7.2 µm in diam., ± regular in outline, seldom clearly inflated, thin- to slightly thick-walled. SUBHYMENIAL HYPHAE hyaline, 3.5-8 µm in diam., ± inflated and closely septate, thin-walled.

BASIDIA constricted in a suburniform way, 38.5-52 x 8-11.2 µm, 4-sterigmate, hyaline, sometimes greenish in KOH. BASIDIOSPORES pale to medium brown, subglobose, often bent or flattened on one side, to slightly

irregular or irregularly globose, aculeolate to echinulate, 7.6-9.6 x 5.6-8 μm or 6.4-8.8 μm across.
HABITAT: on *E. angustifolia* and hymenial surface of an old *Phellinus punctatus*. DISTRIBUTION: 8 (2).
VOUCHER SPECIMENS: private herbarium 70, 9, 7.XII.90, on *E. angustifolia*; MCVE 635, 8, 7.XII.96, on hymenial surface of an old *Phellinus punctatus*.

Tomentella ferruginea (Pers.:Fr.) Pat. Fig. 5.

BASIDIOME effused, adnate, ± separable, hypochnoid to felty. HYMENIAL SURFACE in general olive or with brown tinges, granulose to colliculose, smoother towards the margin which is not differentiated, or lighter bright ferruginous to yellowish brown, porose-reticulate. SUBICULUM yellowish brown.

HYPHAL SYSTEM dimitic: generative hyphae nodose-septate. SUBICULAR GENERATIVE HYPHAE yellowish brown, 2.5-5.5 μm in diam., regular in outline, rarely simple-septate, thin- to slightly thick-walled, sometimes with ± homogeneous brownish contents or with granular encrusting material. SKELETAL HYPHAE rare to frequent or apparently present only in hyphal cords, citrine, 1.5-2 μm in diam., thick-walled, some adventitious septa may occur. HYPHAL CORDS rare to abundant, citrine to brown, up to 80 μm wide, composed of generative, 1.5-4 μm in diam, and/or skeletal hyphae. SUBHYMENIAL HYPHAE subhyaline, 2.5-5 μm in diam., thin-walled. BASIDIA narrowly clavate, 50-55 x 8-10 μm, 4-sterigmate, subhyaline, often with contents and encrusting material appearing brown when mounted in water but becoming greenish in KOH. The encrusting material easily dissolves in KOH with abundant diffusate. BASIDIOSPORES yellowish brown, lobed or less frequently irregularly globose to irregular, echinulate, 5.5-8 μm across or 6.5-9.5 x 5.5-7.5 μm.
HABITAT: on various deciduous trees and *P. pinea*. DISTRIBUTION: 1 (1), 2 (2), 7 (1), 8 (4), 11 (5).
VOUCHER SPECIMENS: private herbarium 69, 11, 11.XI.90, on *A. glutinosa*; 165, 8, 30.X.93, on *R. pseudoacacia*; 210, 8, 30.X.93, on *P. pinea*; 211, 8, 30.X.93, on *R. pseudoacacia*; 875, 11, 13.VI.94, on *A. glutinosa*; 991, 1, 7.X.95, on deciduous wood; 1064, 8, 18.V.96, on *E. angustifolia*; MCVE 637, 11, 17.X.93, on *A. glutinosa*; 11464, 11, 28.XI.93, on *A. glutinosa*; 11465, 7, 1.X.94, on deciduous wood; 11466, 11, 2.X.94, on *A. glutinosa*; 11467, 2, 8.X.94, on *Q. pedunculata*.

Tomentella italica (Sacc.) M.J.Larsen. Fig. 6.

BASIDIOME effused, adnate, separable, hypochnoid to felty. HYMENIAL SURFACE whitish to avellaneous or umber, smooth, colliculose or mostly odontoid with blunt or conical aculei up to 2 mm long and sometimes fused giving the area a labyrinthiform or somewhat poroid appearance; margin smooth brown and not especially differentiated or whitish fimbriate. SUBICULUM darker than the fertile area.

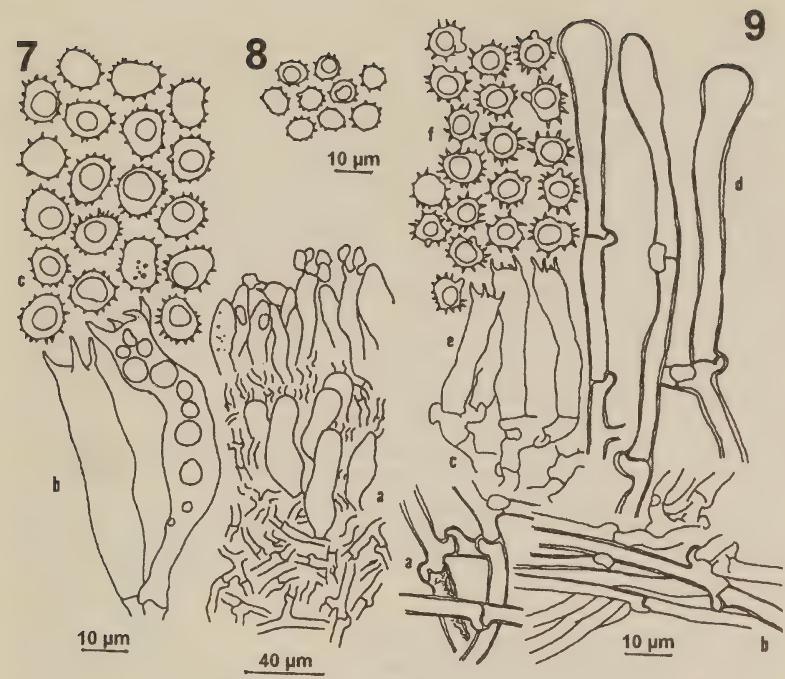


Fig. 7. *Tomentella nitellina*. a) basidiome section; b) basidia; c) basidiospores. **Fig. 8**. *Tomentella terrestris*. Basidiospores. **Fig. 9**. *Tomentella pilosa*. a) subicular hyphae; b) hyphal cords; c) subhymenial hyphae; d) cystidia; e) basidia; f) basidiospores.

HYPHAL SYSTEM monomitic: hyphae nodose-septate. SUBICULAR HYPHAE medium brown, 4-8 µm in diam., ± regular in outline, slightly thick-walled, often encrusted with granular or spinulose material which tends to dissolve in KOH. HYPHAL CORDS frequent, 20-50 µm wide, brown. SUBHYMENIAL HYPHAE subhyaline, 3.5-7 µm in diam., thin-walled seldom encrusted. BASIDIA utriform to subclavate, 50-60 x 8-12 µm, 4-sterigmate, hyaline. BASIDIOSPORES subhyaline to pale brown, irregularly globose or slightly elongated along one axis and irregular or somewhat subglobose, aculeolate-echinulate to echinulate-aculeate with frequent bifurcate ornamentation, 6.5-7.5 µm across or 7.2-9.5 x 6.5-7.2 µm.
HABITAT: on *U. campestris* and *R. pseudoacacia*. DISTRIBUTION: 3 (1), 5(1).
VOUCHER SPECIMENS: private herbarium 197, 3, 11.XI.93, on *R. pseudoacacia*; MCVE 631, 5, 9.X.93, on *U. campestris*.

Tomentella nitellina Bourdot & Galzin. Fig. 7.

BASIDIOME effused, adherent, at first arachnoid to hypochnoid, then felty or when older somewhat crustose and sometimes cracking in irregular pieces with loosening margins. HYMENIAL SURFACE yellowish brown to dark brown, smooth to finely granulose; margin not differentiated or whitish cottony-fimbriate. SUBICULUM darker than the fertile area.

HYPHAL SYSTEM monomitic: generative hyphae nodose-septate. SUBICULAR HYPHAE medium to dull brown, 3.2-5.5 µm in diam., regular in outline, thick-walled. SUBHYMENIAL HYPHAE subhyaline to medium brown, slightly irregular in outline with swollen parts up to 8 µm wide, thin-walled; subhymenium is also composed of bladder-like immature basidia of varying shapes, medium to dull brown, up to 18.5 µm wide. BASIDIA mostly utriform, 65-80 x 9.5-15 µm, 4-sterigmate, hyaline to brownish. BASIDIOSPORES brown, irregularly globose to irregular, rarely somewhat subglobose or lobed, aculeolate-echinulate to echinulate, 8-11,2 µm across or (8.8-) 9.5-11.2 (-12.4) x (6.8-) 7.6-9.6 µm.

HABITAT: on *A. glutinosa* and *E. angustifolia*. DISTRIBUTION: 9 (1), 11 (1).

VOUCHER SPECIMENS: private herbarium 311, 11, 14.V.95, on *A. glutinosa*; MCVE 630, 9, 1.V.94, on *E. angustifolia*.

REMARKS: the closest relative of *T. nitellina* is *T. terrestris*; the only difference of importance seems to be the smaller size of the basidiospores of the latter (Fig. 8).

Tomentella pilosa (Burt) Bourdot & Galzin. Fig. 9.

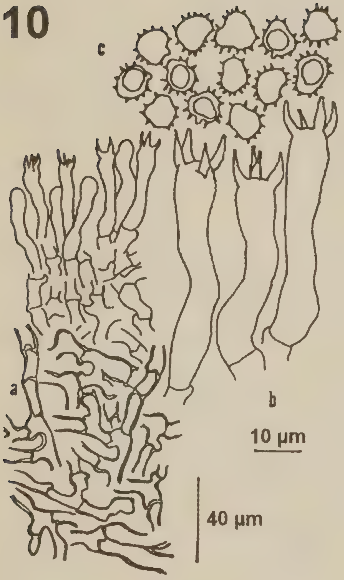
BASIDIOME effused, adnate, separable, byssoid or hypochnoid to felty. HYMENIAL SURFACE light to dark brown but also golden yellow, yellow ochre or ferruginous, even to granulose or colliculose; margin not differentiated or lighter, arachnoid or filamentose. SUBICULUM ± concolorous with the fertile area.

HYPHAL SYSTEM monomitic: hyphae nodose-septate. SUBICULAR HYPHAE yellowish to brownish, 4-5.5 µm in diam., rather regular in outline, seldom simple-septate, ± thick-walled, sometimes finely encrusted. HYPHAL CORDS usually abundant, brown, 15-40 µm wide. SUBHYMENIAL HYPHAE subhyaline to yellowish, 3.5-5.5 µm in diam., ± thin-walled. CYSTIDIA arising mostly from subicular hyphae, frequent, embedded or emerging, cylindrical, distally clavate or more often capitate, 6-13.5 µm at the apex, hyaline to yellowish, rarely slightly encrusted, ± thin-walled, the apical cell up to 80 µm long. BASIDIA utriform, 32-55 x 8-11 µm, 4-sterigmate, hyaline. BASIDIOSPORES yellowish-brown, irregularly globose to lobed or slightly elongated along one axis and irregular, echinulate to aculeate, 6-8.5 µm across or 7-9.5 x 6-7.5 µm.

HABITAT: on deciduous wood. DISTRIBUTION: 2 (3), 8 (3), 11 (1).

VOUCHER SPECIMENS: private herbarium 208, 2, 16.X.93, on *C. betulus*; 289, 2, 27.XI.93, on *Q. pedunculata*; 986, 2, 1.X.95, on *C. betulus*; 1146, 8, 20.X.96, on *P. alba*; 1148, 8, 20.X.96, on *R. pseudoacacia*; MCVE 624, 8, 30.X.93, on *P. tremula*.

10



11

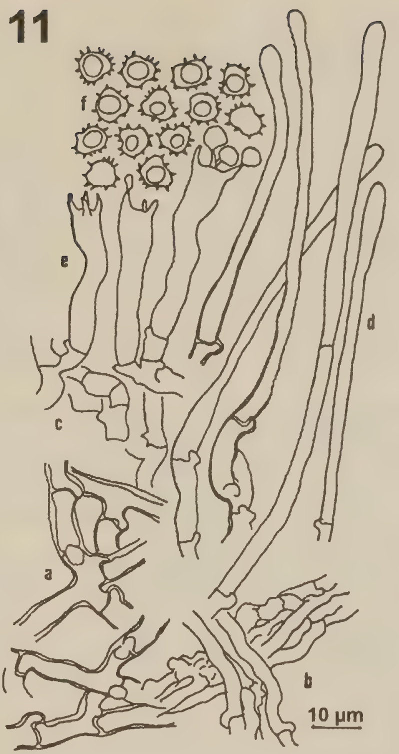


Fig. 10. *Tomentella sublilacina*. a) basidiome section; b) basidia; c) basidiospores. **Fig. 11.** *Tomentella subtestacea*. a) subicular hyphae; b) hyphal cords; c) subhymenial hyphae; d) cystidia; e) basidia; f) basidiospores.

Tomentella sublilacina (Ellis & Holway) Wakef. Fig. 10.

BASIDIOME effused, adnate, adherent, hypochnoid to felty. HYMENIAL SURFACE brown, reddish brown or violet brown, smooth to colliculose; margin not differentiated or white arachnoid to filamentose-fimbriate. SUBICULUM concolorous with or darker than the fertile area.

HYPHAL SYSTEM monomitic: hyphae nodose-septate. SUBICULAR HYPHAE hyaline to medium brown, 4-10 µm in diam., rather closely septate, irregular in outline with swollen parts especially at the septa, ± thick-walled. SUBHYMENIAL HYPHAE hyaline, subhyaline to pale brown towards the hymenium, 5.5-12 µm in diam., inflated, thin- to slightly thick-walled. BASIDIA utriform to suburniform, 40-60 x 8-11 µm, 4-sterigmate, hyaline. BASIDIOSPORES brown to reddish brown, irregularly globose to lobed or irregular, echinulate, 6-8 µm across or 7-11 x 6-9 µm.

HABITAT: common on deciduous wood, on hymenial surface of an old *Ganoderma australe*. DISTRIBUTION: 2 (7), 4 (1), 8 (2), 11 (9).

VOUCHER SPECIMENS: private herbarium 68, 11, 24.VI.90, on *A. glutinosa*; 200, 4, 4.XI.93, on hymenial surface of an old *Ganoderma australe*; 287, 2, 27.XI.93, on *Q. pedunculata*; 961, 11, 18.VI.95, on *A. glutinosa*; 984, 2, 1.X.95, on *Q. pedunculata*; 985, 2, 1.X.95, on *Q. pedunculata*; 1177, 11, 27.X.96, on *A. glutinosa*; MCVE 638, 11, 22.VI.91, on *A. glutinosa*; 11468, 11, 28.VII.91, on *A. glutinosa*; 11469, 11, 3.XI.91, on *A. glutinosa*; 11470, 2, 16.X.93, on *C. betulus*; 11471, 8, 30.X.93, on *E. angustifolia*; 11472, 11, 28.XI.93, on *A. glutinosa*; 11473, 8, 24.IV.94, on *E. angustifolia*; 11474, 2, 14.V.94, on *C. betulus*; 11475, 2, 8.X.94, on *C. betulus*; 11476, 2, 23.V.95, on *C. betulus*; 11477, 11, 2.VI.96, on *A. glutinosa*; 11478, 11, 27.X.96, on *A. glutinosa*.

Tomentella subtestacea Bourdot & Galzin. Fig. 11.

BASIDIOME effused, adnate, adherent, hypochnoid. HYMENIAL SURFACE at first whitish or greyish white, then pale to medium brown with a light shade of rose or greyish brown, colliculose; margin whitish arachnoid or not differentiated. SUBICULUM concolorous with or darker than the fertile area.

HYPHAL SYSTEM monomitic: hyphae nodose-septate. SUBICULAR HYPHAE brown to yellowish brown, 3.5-6.5 μm in diam., rather regular in outline, rarely simple-septate, thick-walled, sometimes with encrusting material giving the walls a spinulose or rough appearance. HYPHAL CORDS infrequent, 15-40 μm wide. SUBHYMENIAL HYPHAE hyaline to pale yellowish, 3-5 μm in diam., thin- to slightly thick-walled. CYSTIDIA originating in subhymenium or rarely in subiculum; frequent, emerging, cylindrical, obclavate and/or slightly expanded towards the apex which is 3.2-5 μm in diam., hyaline, thin-walled, up to 120 μm long. BASIDIA utriform, 30-40 x 6.5-7 μm, 4-sterigmate, hyaline. BASIDIOSPORES pale to medium brown, lobed or less frequently irregularly globose or slightly elongated along one axis and in that case irregular, echinulate, 5.5-7 μm across or up to 8 μm long.

HABITAT: on *C. betulus*. DISTRIBUTION: 2 (1).

VOUCHER SPECIMEN: private herbarium 205 and MCVE 633, 2, 16.X.93, on *C. betulus*.

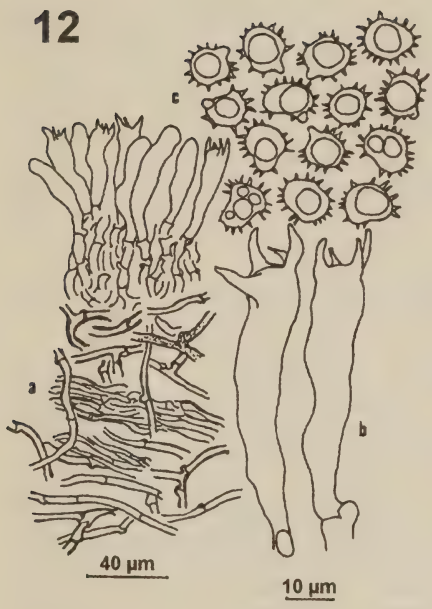
REMARKS: lack of cystidia with encrusting material and smaller size of the basidiospores are distinctive details of this specimen.

Tomentella terrestris (Berk. & Br.) M.J.Larsen. Fig. 8.

BASIDIOME effused, adnate, adherent, hypochnoid to subceraceous. HYMENIAL SURFACE medium to dark brown, smooth; margin whitish to pale yellow ochre, arachnoid, byssoid or fibrillose. SUBICULUM lighter than the fertile area.

HYPHAL SYSTEM monomitic: generative hyphae nodose-septate. SUBICULAR HYPHAE subhyaline to pale brown or yellowish brown, 3-5.5

12



13

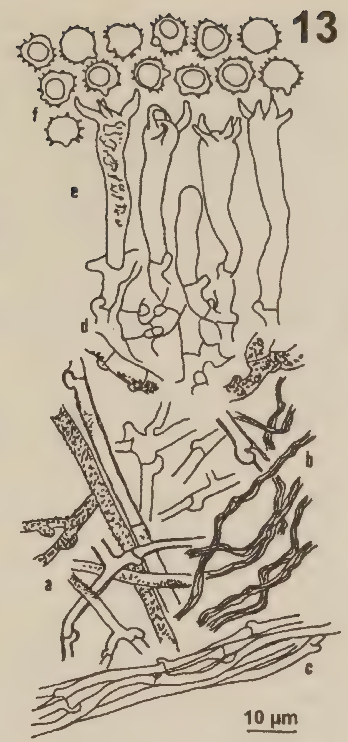


Fig. 12. *Tomentella testaceogilva*. a) basidiome section; b) basidia; c) basidiospores. **Fig. 13**. *Tomentella umbrinospora*. a) subicular generative hyphae; b) skeletal hyphae; c) hyphal cords; d) subhymenial hyphae; e) basidia; f) basidiospores.

(-6.5) µm in diam., ± regular in outline, slightly thick-walled. HYPHAL CORDS rare to absent, medium brown, 20 µm wide, individual hyphae 2.5-4.5 µm in diam.. SUBHYMENIAL HYPHAE similar to the subicular ones but darker, subhyaline towards the hymenium; in the subhymenium there are numerous bladder-like immature basidia of varying shapes, up to 100 µm long and 20 µm wide, pale to dull brown. BASIDIA utriform, up to 85 x 15 µm, 4-sterigmate, hyaline. BASIDIOSPORES pale to medium brown or yellowish brown, irregularly globose to somewhat globose or slightly elongated along one axis, aculeolate to echinulate, 5.5-8 µm across.
HABITAT: on *A. glutinosa* and *Erianthus ravennae* (L) Beauv.
DISTRIBUTION: 11 (2).
VOUCHER SPECIMENS: private herbarium 128, 11, 9.V.92, on *Alnus glutinosa*; MCVE 634, 11, 28.XI.93, on *A. glutinosa*.
REMARKS: see *T. nitellina*.

Tomentella testaceogilva Bourdot & Galzin. Fig. 12.

BASIDIOME effused, adnate, separable, hypochnoid. HYMENIAL SURFACE yellowish brown, smooth; margin whitish, fibrillose or arachnoid. SUBICULUM ± concolorous with the fertile area.

HYPHAL SYSTEM monomitic: hyphae nodose-septate. SUBICULAR HYPHAE subhyaline to yellowish brown, 3-5 µm in diam., regular in outline or slightly swollen at the clamps, simple septa scattered but also frequent along some hyphae, thick-walled, sometimes with granular contents. HYPHAL CORDS infrequent, 20-25 (-65) µm wide. SUBHYMENIAL HYPHAE hyaline to pale yellowish, 3.5-6.5 µm in diam., thin- to slightly thick-walled. BASIDIA utriform, 45-65 x 11.2-15 µm, 4-sterigmate, hyaline. BASIDIOSPORES pale brown to pale yellowish brown, irregular to irregularly globose or lobed, echinulate to aculeate, 8-12 (-12.8) x 6.5-9 µm or (5.8-) 6.4-9.6 µm across.

HABITAT: on *P. nigra*. DISTRIBUTION: 8 (1).

VOUCHER SPECIMEN: private herbarium 179 and MCVE 625, 11, 30.X.93, on *P. nigra*.

Tomentella umbrinospora M.J.Larsen. Fig. 13.

BASIDIOME effused, adnate, ± separable, hypochnoid. HYMENIAL SURFACE reddish brown to fulvous, granulose-colliculose to smooth; margin not differentiated or arachnoid and ± concolorous, partly cordonic. SUBICULUM yellowish brown.

HYPHAL SYSTEM dimitic: generative hyphae nodose-septate. SUBICULAR GENERATIVE HYPHAE subhyaline to light yellow, 1.5-4.5 µm in diam., regular in outline or slightly swollen at the septa, rarely simple-septate, thin- to somewhat thick-walled, sometimes encrusted either with spinulose citrine material or more often with ferruginous brown granulose material which dissolves partly in water and completely in KOH producing a yellowish brown diffusate. SKELETAL HYPHAE citrine, 1.5-2 µm in diam., thick walled. HYPHAL CORDS few, yellowish, up to 20 µm wide, composed of generative hyphae 1.5-3.5 µm in diam.. SUBHYMENIAL HYPHAE subhyaline to light yellow, 3-5.5 µm in diam., thin walled, often encrusted with granular material similar to that on subicular ones. BASIDIA clavate to narrowly clavate, 35-50 x 6.5-9 µm, 4-sterigmate, hyaline to subhyaline, sometimes with yellow ochre homogeneous or granular contents. BASIDIOSPORES rust brown, irregularly globose or slightly elongated along one axis, less frequently lobed, aculeolate-echinulate to echinulate, rarely with bifurcate warts, 5.5-9 µm across.

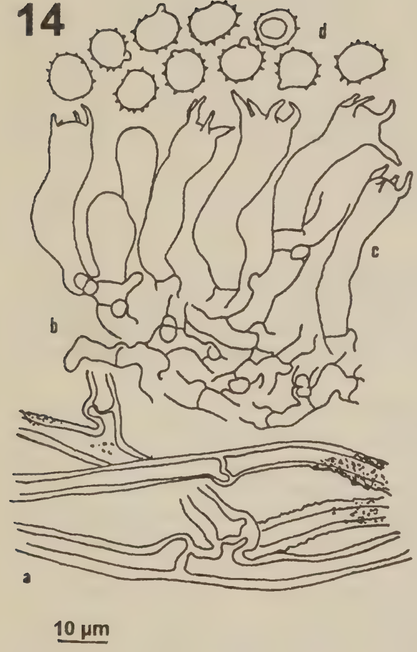
HABITAT: on *C. betulus*. DISTRIBUTION: 1 (1).

VOUCHER SPECIMEN: private herbarium 213 and MCVE 626, 1, 23.X.93, on *C. betulus*.

Tomentella violaceofusca (Sacc.) M.J.Larsen. Fig. 14.

BASIDIOME effused, ± adherent, hypochnoid to felty. HYMENIAL SURFACE brownish grey, reddish grey, smooth to granulose; margin usually not differentiated. SUBICULUM darker than the fertile area.

14



15

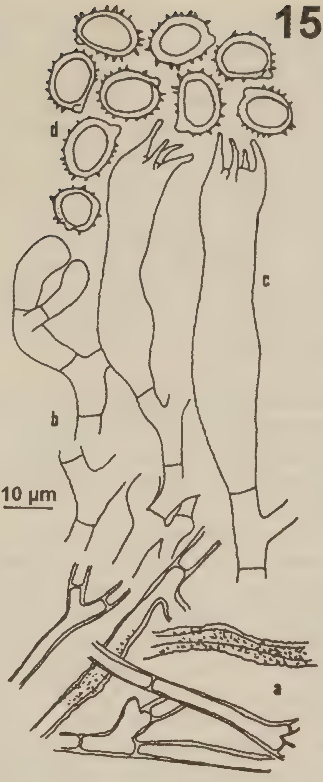


Fig. 14. *Tomentella violaceofusca*. a) subicular hyphae; b) subhymenial hyphae; c) basidia; d) basidiospores. **Fig. 15**. *Tomentellastrum alutaceoumbrinum*. a) subicular hyphae; b) subhymenial hyphae; c) basidia; d) basidiospores.

HYPHAL SYSTEM monomitic: hyphae nodose-septate. SUBICULAR HYPHAE brownish grey to brown, 4-8 µm in diam., regular in outline, thick-walled, ± encrusted with material giving the hyphae a spinulose or a rough appearance. HYPHAL CORDS rare or lacking, 30-45 µm wide. SUBHYMENIAL HYPHAE hyaline to light brown, 2.5-6.5 µm in diam., thin- to slightly thick-walled, sometimes finely and irregularly encrusted. BASIDIA utriform, 35-50 x 9.5-11 µm, 4-sterigmate, hyaline; very little green in KOH.
BASIDIOSPORES light brown, globose to subglobose, often flattened on one side or slightly irregular, aculeolate to echinulate-aculeate, 6.3-10 (-11) x 6.5-9.5 µm.
HABITAT: common on deciduous and coniferous wood, paper. DISTRIBUTION: 2 (1), 6 (1), 7 (1), 8 (6), 9 (8), 11 (4).

VOUCHER SPECIMENS: private herbarium 1132, 9, 20.X.96, on *P. tremula*; 1133, 9, 20.X.96, on *P. tremula*; 1135, 9, 20.X.96, on *P. tremula*; 1145, 8, 20.X.96, on *R. pseudoacacia*; 1150, 8, 20.X.96, on burnt wood of *Pinus sp.*; 1170, 7, 26.X.96, on *P. tremula*; 1193, 6, 9.XI.96, on deciduous wood; MCVE 636, 11, 25.IV.89, on paper; 11450, 11, 26.VI.90, on *A. glutinosa*; 11451, 8, 14.XI.92, on *P. tremula*; 11452, 8, 30.X.93, on *P. tremula*; 11453, 8, 30.X.93, on *P. tremula*; 11454, 8, 30.X.93, on *P. pinea*; 11455, 9, 14.XI.93, on deciduous wood; 11456, 9, 14.XI.93, on deciduous wood; 11457, 9, 14.XI.93, on burnt wood of *Pinus sp.*; 11459, 11, 2.X.94, on *A. glutinosa*; 11461, 9, 4.VI.95, on *R. pseudoacacia*; 11462, 9, 4.VI.95, on *Pinus sp.*; 11463, 11, 26.XI.95, on *A. glutinosa*.

REMARKS: the name for this species now seems to be *T. lapidum* (Pers.) Stalp. (1984).

Tomentellastrum alutaceoumbrinum (Bres.) M.J.Larsen. Fig. 15.

BASIDIOME effused, adnate, ± separable, felty. HYMENIAL SURFACE pale to medium brown, greyish brown, greyish white, cinereous, smooth; margin whitish, byssoid, filamentose-fimbriate. SUBICULUM darker than the fertile area.

SUBICULAR HYPHAE medium to dark brown, 4-6.5 µm in diam., regular in outline, simple-septate or very rarely nodose-septate, ± thick-walled, sometimes encrusted with granular material. SUBHYMENIAL HYPHAE subhyaline to medium brown, 3-8 µm in diam., simple-septate, thin- to slightly thick-walled. BASIDIA utriform, 55-105 x 12-15 µm, 4-sterigmate, hyaline to brownish. BASIDIOSPORES medium brown, subglobose, often flattened on one side, seldom nearly globose, thick-walled, aculeolate to echinulate, 11-15.2 x 8-12 µm.

HABITAT: on *R. pseudoacacia*. DISTRIBUTION: 3 (1).

VOUCHER SPECIMEN: private herbarium 183 and MCVE 627, 3, 11.XI.93, on *R. pseudoacacia*.

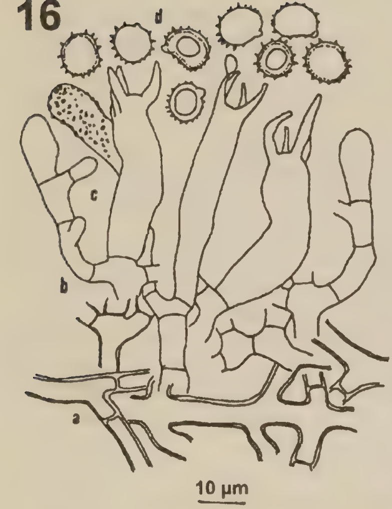
REMARKS: the hymenial greyish tones of the specimen in question are more characteristic of descriptions of Svrcek (1960) as *T. macrosporum* Höhnel & Litsch. and of Bourdot & Galzin (1924) as *Tomentella mycophila* Bourdot & Galzin.

Tomentellastrum caesiocinereum Svrcek. Fig. 16.

BASIDIOME effused, adnate, ± adherent, hypochnoid to subceraceous. HYMENIAL SURFACE cinereous with light turquoise blue tints (particularly to begin with), brownish, brownish grey, brownish black, violet brown, smooth to colliculose; margin not differentiated or paler, arachnoid to filamentose-fimbriate. SUBICULUM darker than the fertile area.

SUBICULAR HYPHAE medium to dark brown, 4-6.2 (-8) µm in diam., mostly regular in outline, simple-septate, thick-walled, sometimes with encrusting granular material visible in water. SUBHYMENIAL HYPHAE hyaline to dull brown, 3-7.5 µm in diam., simple-septate, thin- to slightly thick-walled, often encrusted with granular material when mounted in water,

16



17

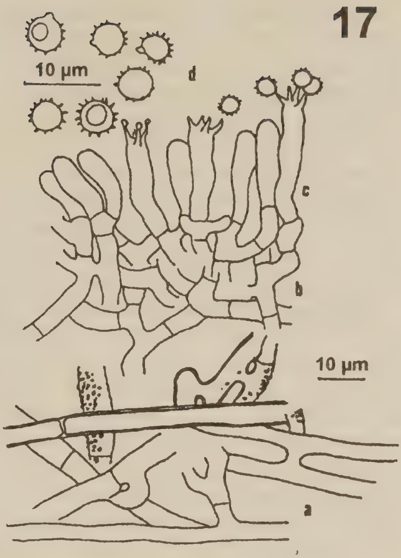


Fig. 16. *Tomentellastrum caesiocinereum*. a) subicular hyphae; b) subhymenial hyphae; c) basidia; d) basidiospores. **Fig. 17.** *Tomentellopsis pusilla*. a) subicular hyphae; b) subhymenial hyphae; c) basidia; d) basidiospores.

sometimes greenish in KOH. BASIDIA utriform, 35-48 x 8.8-11.2 µm, 4-sterigmate, hyaline, numerous with adhering granular material in water mounts, sometimes greenish in KOH. BASIDIOSPORES medium brown, slightly elongated along one axis to subglobose, often flattened on one side or somewhat bent, infrequently globose, ± thick-walled, aculeolate to nearly echinulate, 8-10.4 x 7-9 µm or 7.2-9.6 µm across.

HABITAT: on *P. alba*. DISTRIBUTION: 8 (1), 9 (3).

VOUCHER SPECIMENS: private herbarium 313, 9, 1.V.94, on *P. alba*; 314, 9, 1.V.94, on *P. alba*; 1205, 8, 18.V.96, on *P. alba*; MCVE 632, 9, 20.X.96, on *P. alba*.

Tomentellina fibrosa (Berk. & M.A.Curtis) M.J.Larsen.

HABITAT: mostly on deciduous wood, sometimes on *Pinus*. DISTRIBUTION: 6 (1), 8 (5), 9 (5), 11 (6).

VOUCHER SPECIMENS: private herbarium 227, 9, 2.IV.89, on deciduous wood; 968, 11, 17.IX.95, on *A. glutinosa*; 1147, 8, 20.X.96, on burnt wood of *Pinus sp.*; 1191, 6, 9.XI.96, on *P. tremula*; MCVE 2722, 11, 17.X.93, on *A. glutinosa*; 2723, 11, 17.X.93, on unidentified wood; 2680, 8, 30.X.93, on *P. pinea*; 2682, 8, 30.X.93, on litter; 2668, 9, 14.XI.93, on *R. pseudoacacia*; 2669, 9, 14.XI.93 on pine-cone of *P. pinea*; 2670, 9, 14.XI.93, on *Pinus sp.*;

2715, 11, 28.XI.93, on *A. glutinosa*; 3705, 8, 24.IV.94, on well-decayed wood; 3775, 9, 1.V.94, on deciduous wood; 4471, 11, 16.VII.94, on *A. glutinosa*; 5687, 11, 2.X.94, on litter; 9900, 8, 18.V.96, on *Pinus sp.*.
REMARKS: common and very characteristic species recently proposed as *Tomentella* (Koljalg 1995).

Tomentellopsis pusilla Hjortstam. Fig. 17.
BASIDIOME effused, adnate, separable, pellicular to membranous. HYMENIAL SURFACE bright mustard yellow with rare light orange tints, smooth to colliculose; margin not differentiated or paler arachnoid to filamentose. SUBICULUM ± concolorous with the fertile area.

SUBICULAR HYPHAE hyaline to pale yellow, 3-8 µm in diam., mostly regular in outline, simple-septate or clamps rarely present, thin- to slightly thick-walled, often encrusted with yellowish brown granular material which disappears almost completely in KOH. SUBHYMENIAL HYPHAE hyaline to subhyaline, 3.2-6.5 µm in diam., thin-walled, seldom encrusted. BASIDIA utriform, 23-27 x 4.8-5.6 µm, 4-sterigmate, hyaline. BASIDIOSPORES hyaline to pale citrine, globose or slightly elongated along one axis, aculeolate to aculeolate-echinulate, 3.6-4.8 µm across.
HABITAT: on *U. campestris*. DISTRIBUTION: 5 (1).
VOUCHER SPECIMEN: private herbarium 189 and MCVE 628, 5, 6.XI.93, on *U. campestris*.
REMARKS: the specimen in question is much brighter than normal (Hjortstam, pers. comm.).

ACKNOWLEDGMENTS

I am much indebted to Dr. M.J. Larsen for his critical review of the manuscript. Drs. K. Hjortstam and U. Koljalg gave their opinion on some of the specimens dealt with, for which I am sincerely grateful. I also wish to thank the following members of the Società Veneziana di Micologia: G. Michilin; G. and M. Robich; L. and L. Zambolin; E. Bizio.

LITERATURE CITED

BERSAN, F. et al., 1994. Censimento della flora micologica della Laguna di Venezia e zone limitrofe. Bull. Mus. civ. St. nat. Venezia 43: 245-313.
BOURDOT, H. & GALZIN, A., 1924. Hyménomycètes de France (X. *Phylactériés*) (Suite). VI. *Tomentella* (Pers.) Pat.. Bull. Soc. Mycol. France 40: 137-162.
KOLJALG, U., 1995. *Tomentella* (*Basidiomycota*) and related genera in Temperate Eurasia. Synopsis Fongorum 9. Fungiflora, Oslo, 213 pp.

LARSEN, M. J., 1967. *Tomentella* and related genera in North America V. New North American records of tomentelloid fungi. Mycopath. et Mycol. Appl. 32: 37-67.

LARSEN, M. J., 1971. Notes on tomentelloid fungi III. New species of *Pseudotomentella*. Bull. Torrey Bot. Club 98: 38-41.

LARSEN, M. J., 1974. Some notes on *Pseudotomentella*. Mycologia 66: 165-168.

LARSEN, M. J., 1983. Notes on tomentelloid fungi V. Additional new species of *Pseudotomentella*. Mycologia 75: 556-562.

STALPERS, J. A., 1993. The Aphyllophoraceous fungi I. Keys to the species of the *Thelephorales*. Stud. Mycol. 35: 1-168.

SVRCEK, M., 1960. Tomentelloideae Cechoslovakiae. Genera resupinata familiae *Thelephoraceae* s. str.. Sydowia 14: 170-245.

MYCOTAXON
Volume LXIV, pp. 261-283 September 1997

MACROMYCETES FROM THE STATE OF PARANÁ, BRAZIL. 6. SIROBASIDIACEAE & TREMELLACEAE

Peter Roberts* & André A. R. de Meijer**

*The Herbarium, Royal Botanic Gardens, Kew, Surrey TW9 3AE, England
**(S.P.V.S.), Cx. P. 305, 80001-970 Curitiba, Paraná, Brazil

Eight species of *Tremella* and one *Sirobasidium* are described and illustrated from Paraná State, Brazil, together with a basidiomycetous hymenial parasite of *Tremella brasiliensis.* The new combination *Sirobasidium rubrofuscum* is proposed. *Tremella spectabilis* is considered a synonym of *T. aurantia*. A key is provided to the eight *Tremella* species so far recorded in Paraná State.

The present paper describes and illustrates specimens of the heterobasidiomycete genera *Tremella* Fr. and *Sirobasidium* Pat., collected by one of us (A.dM.) in Paraná State, Brazil, between 1979 and 1996, and determined or confirmed by the other (P.R.) at the Royal Botanic Gardens, Kew, England. Illustrations are by P.R. The paper forms part of a continuing series recording the larger fungi of Paraná State***. It is intended that a future paper should cover the *Exidiaceae* R.T. Moore, here considered distinct from the *Tremellaceae* Fr. *s. stricto*. A few specimens from the municipality of Itu in neighbouring São Paulo State are also included among the cited collections.

All the collections were made on unidentified dicotyledonous wood. One additional, unretained collection of *Tremella* cf. *brasiliensis* was made in 'restinga' forest on *Ilex theezans* Martius. No collections were made on

---

*** Previous parts in the series are: 1) Introduction (*Arq. Biol. Tecnol.* 35: 623 - 629, 1992); 2) Myxomycetes (*Arq. Biol. Tecnol.* 35: 631 - 633, 1992); 3) Stipitate hydnums (*Arq. Biol. Tecnol.* 35: 635 - 640, 1992); 4) The psychoactive species (*Arq. Biol. Tecnol.* 36: 313 - 329, 1993); 5) Poroid and lamellate boletes (*Edinb. J. Bot.*, in press).

woody monocotyledonous plants (eg. palms, bamboos, or tree ferns). Two unretained *Tremella* collections were made on conifer wood, namely *T.* cf. *auricularia* (Paraná state, General Carneiro, on dead *Pinus* branch in plantation, 8 June 1989) and an orange-yellow *Tremella* species on native *Araucaria angustifolia* (Bertol.) O. Kuntze. It should be noted that all *Tremella* species are parasitic on the fruit bodies or mycelia of other fungi, so that the plant 'hosts' are secondary substrates.

Additional notes on altitude, frequency, and coded habitat types (based on Veloso & Goés-Filho, 1982) are given in Table 1, together with a key to the habitat codes. The same coded habitat types are also listed for individual collections under 'specimens examined', together with area codes (as in previous papers in this series). Colour codes in species descriptions are based on Kornerup & Wanscher (1978).

Lowy (1971) mentioned eight species of heterobasidiomycetes from Paraná State, all of which he collected himself during April 1966 in the Parque Nacional do Iguaçu, in the extreme west of the state. Only one of these species belongs to the genera treated in this paper, namely *Tremella fuciformis* Berk. Lowy's report represents the only information previously published on the heterobasidiomycetes of Paraná State.

A number of specimens were originally sent to Prof. B. Lowy for identification, some of which he subsequently determined (1988, in litt. to A.dM.). These specimens have been re-examined for the present paper, with Lowy's original determinations noted in the text.

Sirobasidiaceae Lindau

Sirobasidium rubrofuscum (Berk.) P. Roberts comb. nov. [Figs. 1 - 4]
Dacrymyces rubro-fuscus Berk., *Lond. J. Bot.* 4: 61 (1845)
Sirobasidium sanguineum Lagerh. & Pat., *Journ. Bot. Paris* 6: 469 (1892)
Tremella fusca Lloyd, *Mycol. Writ.* 5: 683 (1917)

Fruit body firm-gelatinous, pustular, coalescing and becoming somewhat lobed or cerebriform, 10 mm across, 5 mm in height, dark reddish brown (8EF6), drying almost black. *Hyphae* in a dense, reddish brown, gelatinous matrix, 2 - 4.5 µm wide, with thin or somewhat gelatinized walls, with clamp connexions. *Haustorial cells* absent. *Conidiophores* absent. *Basidia* 4-celled, globose to ellipsoid or somewhat fusiform, 10 - 12 µm wide, unstalked, most catenulate when mature, in chains of 2 - 4. *Sterigmata* deciduous, fusiform, 15 - 20 x 5 - 7.5 µm. *Basidiospores* subglobose (Q = 0.8 - 0.9), 7 - 7.5 x 8 - 8.5 µm, germination not seen.

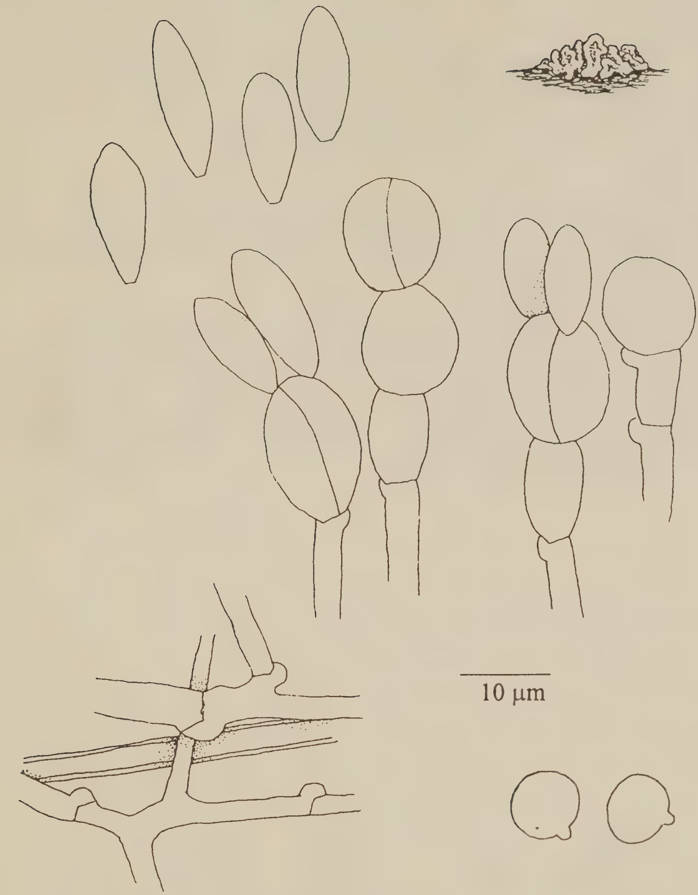


Fig. 1. ***Sirobasidium rubrofuscum***. Fruit body (natural size), deciduous fusiform sterigmata, catenulate basidia, context hyphae, basidiospores (de Meijer 782).

Specimens examined: **BRAZIL, Paraná State**: Curitiba, São José dos Pinhais, Reserva Biológica Cambui, *saf*, on dead wood, 21 Feb. 1987, de Meijer CUa-782, **K(M) 39565**; **Bahia State**: unlocalized, Torrend (ex herb. Lloyd 4009), **BPI 702237**, holotype of *Tremella fusca*; **ECUADOR**: Crater de Pululahuana, 'on *Barnadesia*' on or near *Eutypella* sp., Feb. 1892, **FH**, holotype of *Sirobasidium sanguineum*; **AUSTRALIA, Western Australia**: Swan River, 'on wood...or from some *Sphaeria*', Drummond 212 (ex herb. Berkeley), **K(M) 39155**, holotype.

Sirobasidium rubrofuscum is distinguished by its reddish brown colour, rather small, pustular fruit bodies, and comparatively small basidia in short chains. Unlike most other *Sirobasidium* species, the sterigmata develop apically and it is quite common to find some basidia with all four sterigmata still attached.

Based on a comparison of the holotypes, *Sirobasidium sanguineum* is a synonym of *Dacrymyces rubro-fuscus*, as already noted by McNabb (1973). Re-examination of the holotype of *Tremella fusca*, originally described from Bahia State, Brazil, shows that this too is a synonym, as already noted by Bandoni (1958). The species is associated with, and possibly parasitic on, pyrenomycetes.

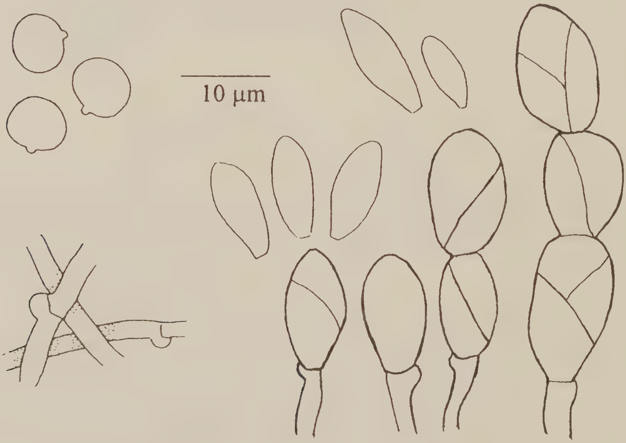
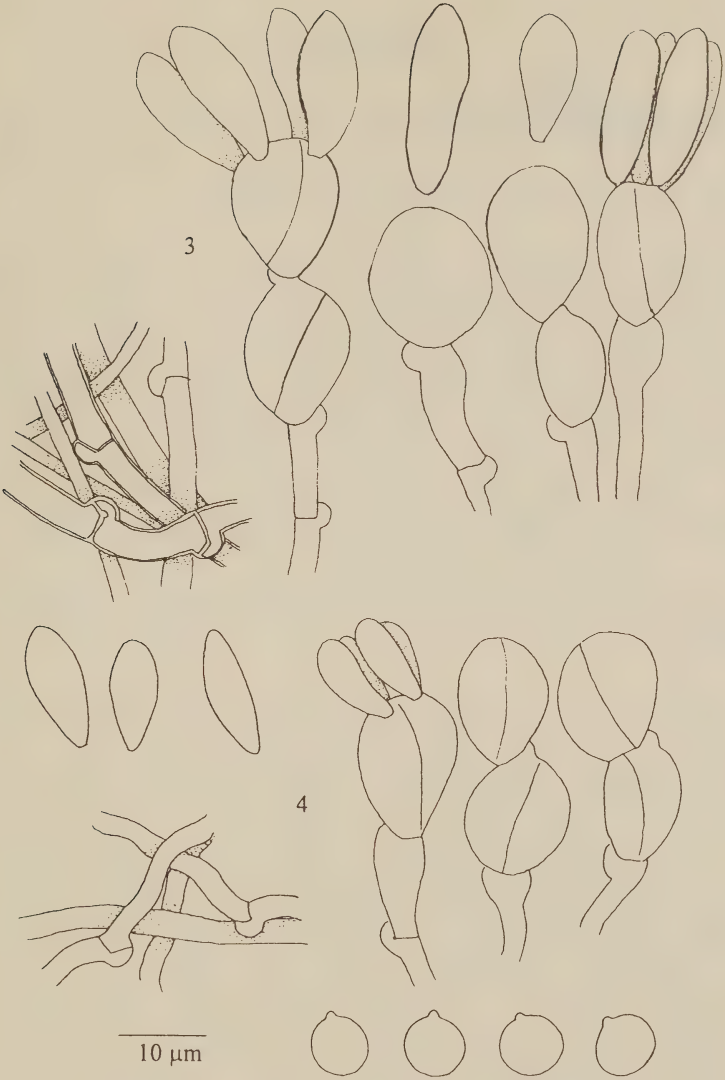


Fig 2. ***Sirobasidium rubrofuscum***. Basidiospores, catenulate basidia and deciduous fusiform sterigmata, context hyphae (holotype collection).



Figs 3 & 4. ***Sirobasidium rubrofuscum***. 3) catenulate basidia and deciduous sterigmata, context hyphae (holotype, *S. sanguineum*); 4) deciduous sterigmata, catenulate basidia, context hyphae, basidiospores (holotype, *Tremella fusca*).

Tremellaceae Fr.

Tremella aurantia Schwein., *Schrift. Nat. Ges. Leipzig* 1: 114 (1822) [Fig. 5]

Tremella australiensis Lloyd, *Myc. Writ.* 4: 45 (1913)
Tremella spectabilis Möller, Protobasid. 122 (1895)

Fruit body firm-gelatinous, compact, densely folded (often becoming foliaceous), 20 mm across (often much larger), bright orange-yellow when fresh, ochraceous when dried. *Hyphae* in a gelatinous matrix, hyaline, 1.5 - 2.5 µm wide, thin-walled, with clamp connexions, intermixed with host hyphae, 4 - 6 µm wide, slightly thick-walled, without clamp connexions. *Haustorial cells* present and conspicuous, mostly globose, 2 - 3 µm wide, giving rise to one or more thin filaments. *Conidiophores* not seen. *Basidia* 2 - 4 celled, 10 - 13 µm wide, widely clavate to subglobose or ellipsoid with a distinct stalk, most with diagonal septa. *Basidiospores* broadly ellipsoid to ellipsoid (Q = 1.2 - 1.4), 7.5 - 10 x 6 - 8 µm, germinating by germ tube or the production of small, yeast-like, ellipsoid conidiospores.

Specimen examined: **BRAZIL, Paraná State**: Curitiba, São José dos Pinhais, Reserva Biológica Cambui, *saf*, on dead branch, 13 Sep. 1979, de Meijer CUa-135, **K(M) 39548 & Herb. AdM**.

Tremella aurantia is a parasite of *Stereum* fruit bodies, the unclamped hyphae of the *Stereum* host remaining visible amongst the clamped *Tremella* hyphae. It is additionally distinguished from similar yellow *Tremella* species by its comparatively small, stalked basidia and broadly ellipsoid to ellipsoid spores. The species is cosmopolitan and has previously been reported from Brazil by Lowy (1971).

From the detailed redescription published by Bandoni & Oberwinkler (1983), it appears that the type specimen of *Tremella spectabilis* (originally described from Brazil) is indistinguishable from *T. aurantia*. The apparent difference in spore size between the two taxa, noted by Bandoni & Oberwinkler, is not supported by measurements from prints of European collections of *T. aurantia* (Roberts, 1995). Accordingly, *T. spectabilis* is here considered a synonym of *T. aurantia*. *T. australiensis* is a further synonym, as previously noted (Roberts, 1995).

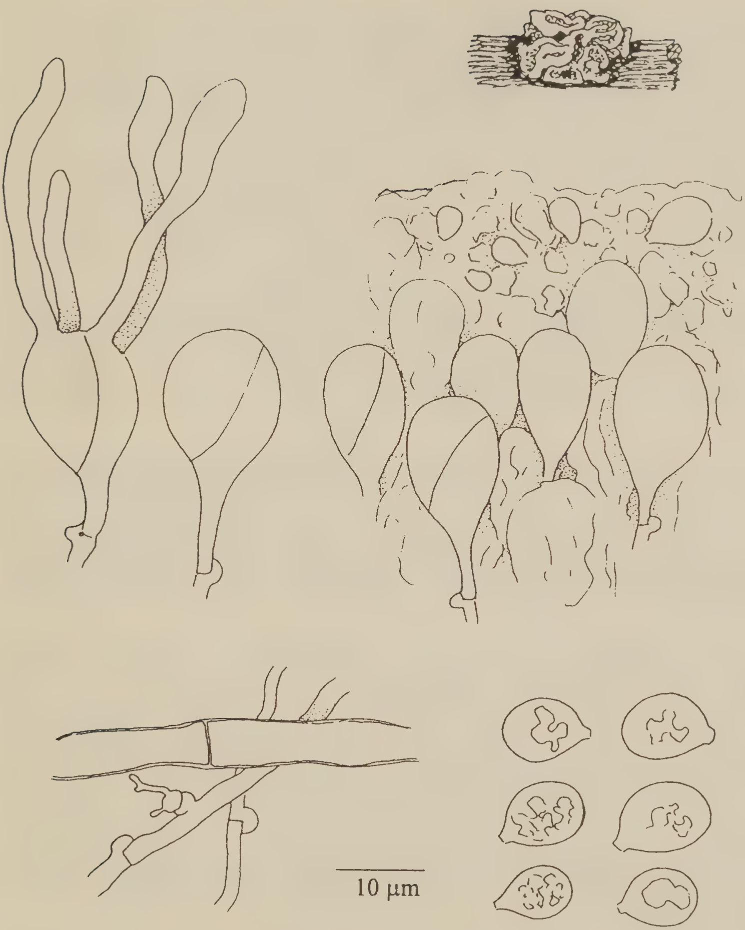


Fig. 5. ***Tremella aurantia***. Fruit body (natural size), stalked basidia, section of hymenium, context hyphae showing haustorial cell and unclamped host hypha, basidiospores (de Meijer 135).

Tremella auricularia Möller, *Protobasid.* 113 (1895) [Fig. 6]

Fruit body gelatinous, sparsely foliaceous, consisting of one to several thin, somewhat plicate, erect or pendulous, ear-like lobes, up to 50 mm across, yellowish brown to brown [(5-6)E5] or brownish orange [(6-7)(C-D)5], becoming greyish orange [5B4-5] towards the margin. *Hyphae* in a fairly dense gelatinous matrix, 1.5 - 5 µm, most thin-walled, some with gelatinized walls up to 1.5 µm thick, hyaline, with clamp connexions. *Haustorial cells* not seen. *Basidia* 2 - 4 celled, comparatively large, subglobose to ellipsoid, 13 - 18 µm wide. *Sterigmata* long and sinuous. *Conidiophores* occasionally present in hymenium, consisting of branched chains of short, slightly swollen hyphal segments, 3 - 4.5 x 1.5 - 2.5 µm, giving rise to terminal conidiospores subtended from clamp connexions. *Conidiospores* arising from conidiophores and basidiospores, mostly ovoid, 3.5 - 4 x 3 µm. *Basidiospores* ellipsoid to oblong (Q = 1.5 - 1.7), rather large, 11 - 13 x (6 -) 7 - 9 µm, germination by germ tube or the production of yeast-like conidiospores.

Specimens examined: **BRAZIL, Paraná State**: General Carneiro, Fazenda São Pedro, *mof*, on decayed twig, 12 May 1990, de Meijer GC-1713, **K(M) 39555**; São Mateus do Sul, *mof*, on decayed twig adjacent to *Tremella brasiliensis*, 23 May 1990, de Meijer SM-1765b, **K(M) 39558**; Parque Marumbi, Capivari, *dof*, on decayed branch, 19 Nov. 1994, de Meijer MA-2953, **K(M) 39554 & Herb. AdM**; Parque Marumbi, Quatro Barras, *dof*, on decayed trunk, 30 Jun. 1996, de Meijer MA-3390, **K(M) 40079 & Herb. AdM**.

Tremella auricularia appears similar to *T. foliacea* Pers.: Fr., but has fewer, simpler fronds or frequently just a single ear-like lobe (as in Fig. 6), a resemblance which led Möller (1895) to give the epithet '*auricularia*' to the species. Microscopically, *T. auricularia* has much larger basidia and basidiospores than *T. foliacea*.

The collections cited above appear to be conspecific with the type specimen, originally described from Brazil and extensively re-examined by Bandoni & Oberwinkler (1983). The species was not treated by Lowy (1971, 1980) and was presumably included within his concept of '*Tremella fimbriata* Fr'.

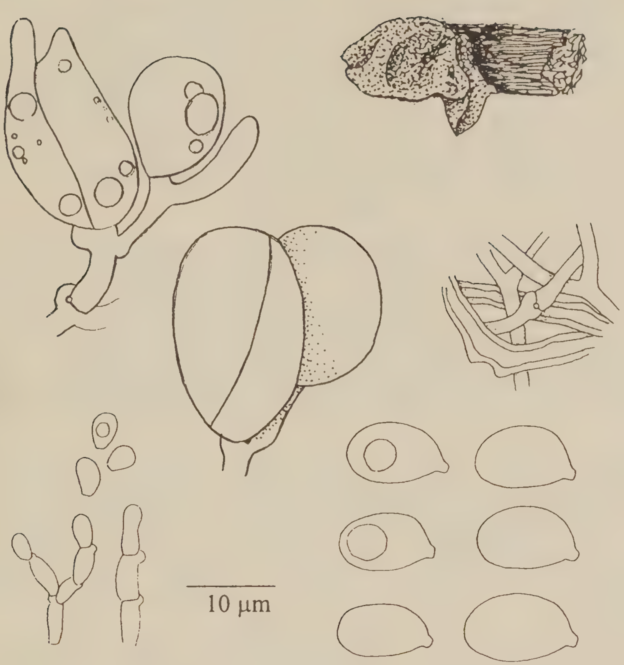


Fig. 6. ***Tremella auricularia***. Basidia, fruit body (natural size), context hyphae, conidiophores and conidia, basidiospores (de Meijer 1765b).

Tremella brasiliensis (Möller) Lloyd, *Myc. Writ.* 7: 1152 (1924) [Fig. 7]
Tremella lutescens f. *brasiliensis* Möller, *Protobasid.* 100 (1895)

Fruit body gelatinous, compactly lobed to sub-foliaceous, up to 30 mm across, 10 mm in height, wholly whitish-hyaline, or yellow to orange or reddish orange [(5-7)A(5-7)] when fresh, dull ochraceous to orange when dried. *Hyphae* in a dense gelatinous matrix, mostly 2.5 - 3.5 µm wide, many with thickened, gelatinized walls, with clamp connexions. *Haustorial cells* conspicuous in some specimens, not seen in others, globose, 2.5 - 3 µm wide, giving rise to thin filaments. *Conidiophores* occasionally present in hymenium, consisting of branched chains of short, slightly swollen hyphae, 3.5 - 7 x 2 - 3.5 µm, giving rise to terminal conidiospores subtended from clamp connexions. *Conidiospores* ovoid to elliptical, 4 - 9 x 3 - 6 µm, arising from conidiophores and (presumably) from basidiospores. *Basidia* 2 - 4 celled, subglobose to oblong, very large, 21 - 33 µm wide, with diagonal or vertical septa, some thick-walled, some with yellowish, oily contents. Sterile surfaces often have an abortive hymenial layer composed of probasidia and sub-basidial cells up to 10 µm wide, with thickened, gelatinized walls. *Basidiospores* globose (Q = 1.0), very large, 14 - 16 µm diam., germination not seen.

Specimens examined: **BRAZIL, Paraná State**: Parque Marumbi, *dof*, on dead branch, 6 Aug. 1987, de Meijer MA-872, **Herb. AdM**; same location, *dof*, on dead trunk, 19 May 1990, de Meijer MA-1733, **Herb. AdM**; same location, *dof*, on decayed wood with hymenial parasite (MA-2310b, K(M) 40069), 4 Jul. 1992, de Meijer MA-2310a, **K(M) 40068**; same location, *dof*, on decayed branch, 27 Apr. 1993, de Meijer MA-2651, **K(M) 39556**; São Mateus do Sul, *mof*, adjacent to *Tremella auricularia* on decayed twig, 23 May 1990, de Meijer SM-1765a, **K(M) 39557**.

Fruit bodies of this species appear almost identical to those of the cosmopolitan *Tremella mesenterica* Retz.: Fr., varying in colour from wholly white to bright yellow or orange, and variously lobate to subfoliaceous. Microscopically, however, *T. brasiliensis* is immediately distinguished by its exceptionally large basidia and large globose basidiospores.

The collection de Meijer 2310 (cited above) contains a basidiomycetous parasite producing abundant conidiophores in parts of the hymenium (other parts appear unaffected). The conidiophores are tubular, hypha-like, 2 - 3 µm wide, weakly branched, and possess clamp connexions. They give rise to conidiospores which are fusiform to oblong or cylindrical (Q = 1.7 - 5.0), 7 - 22 x 4.5 - 5 µm, frequently with part of the clamp connexion attached [Fig. 8].

Bandoni & Oberwinkler (1983) described and illustrated a basidiomycetous parasite in the hymenium of the Brazilian type specimen of *Tremella dysenterica* Möller, but it does not appear to be the same as de Meijer 2310b. The new collection, though containing large numbers of conidiophores and conidia, is somewhat collapsed, so that details of conidial production (eg. whether they are produced terminally, singly, or in chains) are unclear. As a result this new taxon is tentatively referred to the genus *Heteromycophaga* P. Roberts, but is not formally described here.

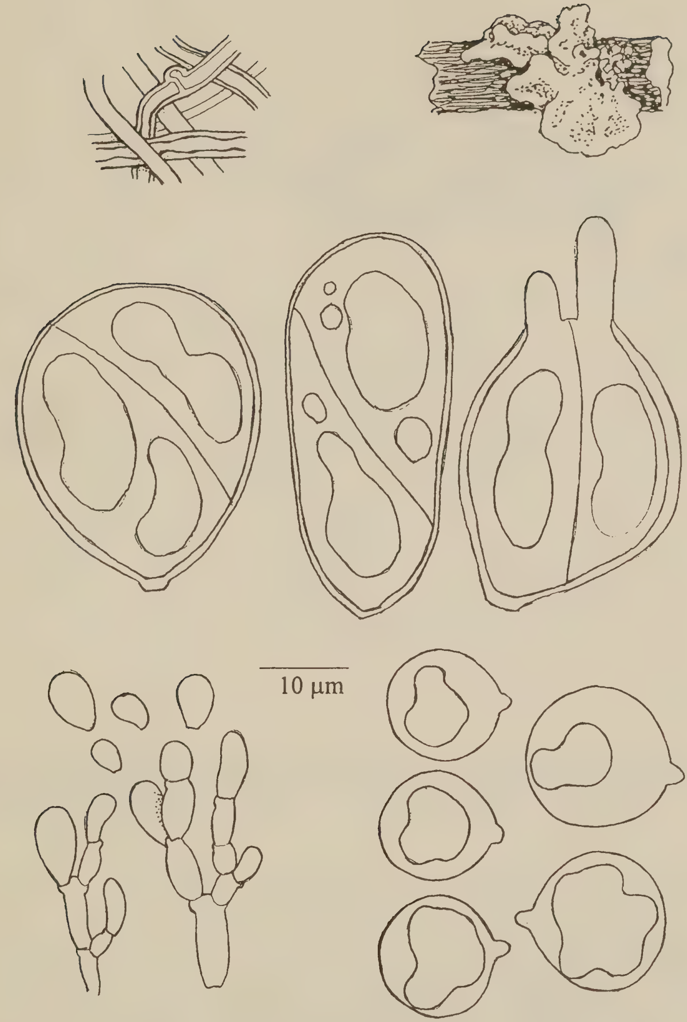


Fig. 7. ***Tremella brasiliensis***. Context hyphae, fruit body (natural size), basidia, conidiophores and conidia, basidiospores (de Meijer 1765a).

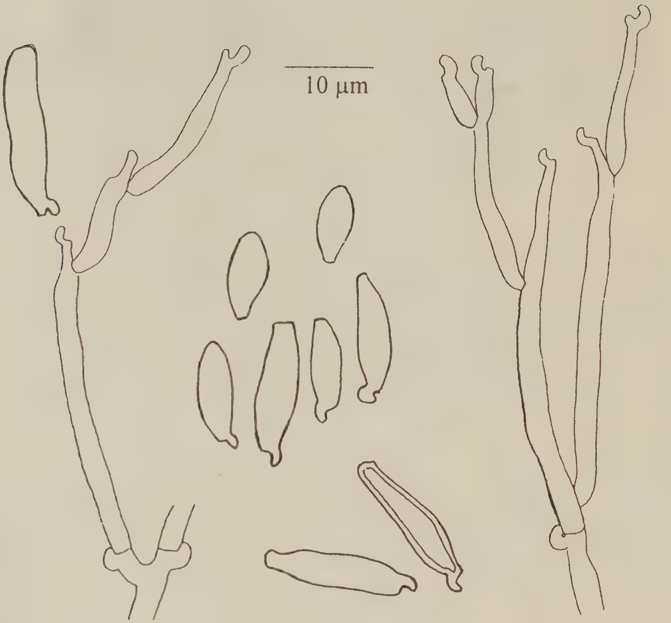


Fig. 8. *Heteromycophaga* sp. in hymenium of *T. brasiliensis*. Conidiophores and conidia, some with the remains of clamp connexions still attached (de Meijer 2310b).

Tremella dysenterica Möller, *Protobasid.* 127 (1895) (Fig. 9)

Fruit body gelatinous, ca. 10 - 40 mm across, up to 10 mm in height, coalescing with neighbouring fruitbodies , irregularly folded and pleated, cerebriform, shallowly and compactly lobed, light yellow [4A4] to bright chrome yellow to bright orange-red [8AB7], scarlet, or brownish red [8C8] on exposed surfaces, fading to hyaline or watery yellow on undersurfaces; red pigment (where present) visible as minute subsurface granules under a stereo microscope. *Hyphae* rather wide, 2.5 - 7.5 µm diam., most with markedly thickened, gelatinized walls up to 3 µm diam., swelling in lactophenol mounts; clamp connexions conspicuous, often open, often

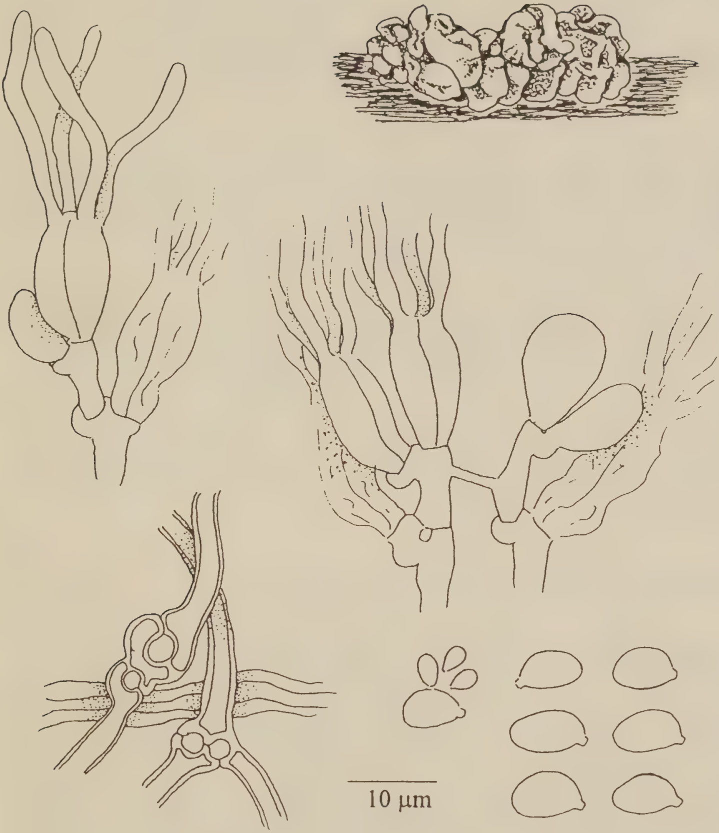


Fig. 9. ***Tremella dysenterica***. Fruit body (natural size), basidia, context hyphae showing thickened walls and open clamp connexions, basidiospores (one germinating) (de Meijer 2778).

complex; haustorial cells not seen; context distinctly gelatinized, not soft; clots of dark red, orange, or bright yellow pigment sometimes visible in parts of the hymenium, also appearing internally in some hyphae and basidia. *Basidia* 4-celled, mostly ellipsoid, 8 - 10 (- 12) µm wide, unstalked, most vertically septate. *Sterigmata* elongated, sinuous. *Conidiophores* none seen. *Basidiospores* ellipsoid (Q = 1.2 - 1.7), 5.5 - 8.5 (- 10) x 4 - 5.5 (- 6.5) µm from mount, germinating by germ tube or by producing small, ovoid to ellipsoid, yeast-like cells, 2.5 - 3 x 1.5 - 2 µm.

Specimens examined: **BRAZIL, Paraná State**: Curitiba, Reserva Biológica Cambui, *saf*, on dead trunk, 18 Feb. 1987, de Meijer CUa-769, **Herb. AdM**; Paranaguá, Alexandra, *dof*, on bark of decayed branch, 12 Jun. 1993, de Meijer PAc-2778, **K(M) 39552**; Fénix, Parque Estadual de Vila Rica do Espirito Santo, *ssf*, on decayed wood, 22 Feb. 1996, de Meijer FE-3279, **K(M) 39553 & Herb. AdM**.

The bright yellow to deep scarlet pigments, the hyphae with thickened gelatinized walls, and the conspicuous, often open, often multiple clamp connexions are features of *Tremella dysenterica* based on Möller's original description and the re-examination of the type collection by Bandoni & Oberwinkler (1983).

The species was not treated by Lowy (1971, 1980), but it should be noted that *T. rubromaculata* Lowy appears to be very similar, and quite possibly identical, to *T. dysenterica*.

Tremella fibulifera Möller, Protobas. 119 (1895) (Fig. 10)

Fruit body gelatinous, ca. 20 mm across, irregularly lobed, white to pale yellow [3A5], drying cream to ochraceous. *Hyphae* in a rather soft gelatinous context, rather wide, 2 - 7 µm diam., ribbon-like, often folding or collapsing in mounts, hyaline, with thin or slightly thickened walls, with conspicuous, often complex, often open clamp connexions. *Haustorial cells* not seen. *Basidia* 4-celled, mostly ellipsoid, 11 - 15 µm wide, unstalked, most longtitudinally septate. *Sterigmata* elongated, sinuous. *Conidiophores* few seen, but occasionally present in the hymenium, perhaps only in younger fruit bodies; composed of short branching chains of slightly swollen hyphal elements, 3 - 7 x 1.5 - 2.5 µm, giving rise to terminal conidia subtended from clamp-connexions. *Conidiospores* ovoid to ellipsoid, 3 - 4 x 1.5 - 2.5 µm. *Basidiospores* ellipsoid (Q = 1.2 - 1.4), 8 - 9 (- 11) x 5.5 - 7 µm from mount, germinating by germ tube or by producing ovoid to ellipsoid, yeast-like cells, 3 - 4 x 1.5 - 2.5 µm, similar to the conidiospores.

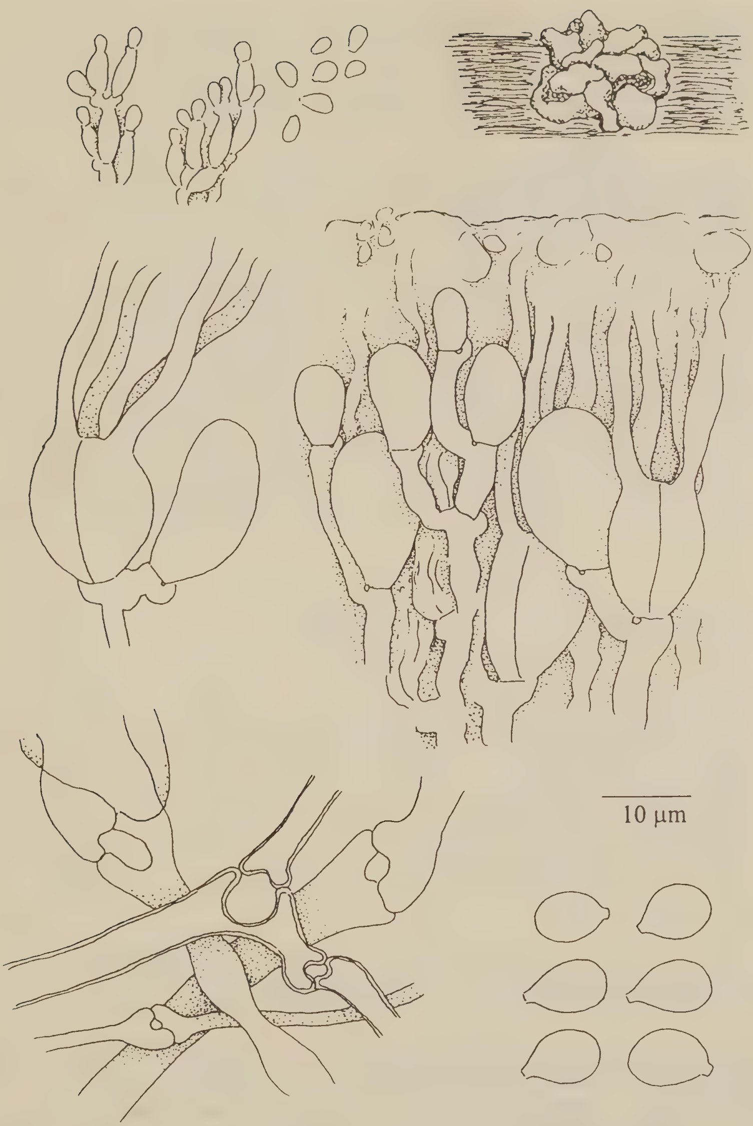


Fig. 10. ***Tremella fibulifera***. Conidiophores and conidia, fruit body (natural size), basidia and hymenial section, context hyphae showing open clamp connexions, basidiospores (de Meijer 1041).

Specimens examined: **BRAZIL**, **Paraná State**: Morretes, Parque Marumbi, *dof*, on dead trunk, 21 Jan. 1987, de Meijer MA-730, **Herb. AdM**; same location, *dof*, on dead branch, 7 Aug. 1987, de Meijer MA-873, **Herb. AdM**; same location, *dof*, on decayed branch, 31 Dec. 1987, de Meijer MA-1041, **K(M) 39561**; same location, *dof*, on decayed trunk, 30 Jun. 1996, de Meijer MA-3389, **K(M) 40075**.

Tremella fibulifera is distinguished by its white to pale yellow, weakly lobed fruit body, soft gelatinous texture, wide hyphae, and conspicuous, often open or loop-like clamp connexions. The soft texture is best appreciated in squash mounts, where, in contrast to the majority of *Tremella* species, the gelatinous context offers little resistance to pressure and hymenial details can be easily observed without the need for thin sectioning. Young or underdeveloped specimens of *T. fuciformis* can appear macroscopically similar to *T. fibulifera*, but have a dense gelatinous texture, thinner hyphae, and distinctive basidia. The Australian species, *Tremella olens* Berk., is also macroscopically similar, but again has a highly gelatinized context and rather tough, thick-walled hyphae.

The specimen de Meijer 730 was originally determined by B. Lowy (1988, in litt. to A.dM.) as *Exidia nucleata* Schwein., the specimen de Meijer 1041 as *T. fibulifera.*

Tremella foliacea Pers., Obs. 2: 98 (1799) (Fig.11)

?Tremella fimbriata Pers., Obs. 2: 97 (1799) [*nom. dub.*]

Fruit body: gelatinous, foliaceous, up to 20 mm across in the specimen cited but often much larger, the fronds branching from base, thin, crisped or plicate at margins, mid- to dark-brown [9F7]. *Hyphae:* in a gelatinous matrix, comparatively narrow, 1.5 - 2.5 µm, hyaline or with brownish incrustation, with clamp connexions. *Haustorial cells:* not seen. *Conidiophores:* not seen. *Basidia:* subglobose to ellipsoid, comparatively small, 9 - 11 µm wide, some directly giving rise to conidiospores in de Meijer 906. *Basidiospores:* ellipsoid (Q = 1.2 - 1.5), 5 - 8 x 4 - 6 µm, germination not seen.

Specimen examined: **BRAZIL**, **Paraná State**: Parque Marumbi, Quatro Barras, *dof*, on twig, 7 Oct. 1987, de Meijer MA-906, **K(M) 39560**.

Tremella foliacea is a cosmopolitan species, originally described from Europe, and previously reported from South America under the name *T. fimbriata* Pers. (Lowy, 1971). The specimen examined is indistinguishable from European material. Distinctive features are the brown, thinly frondose, foliaceous fruit body, comparatively small basidia and

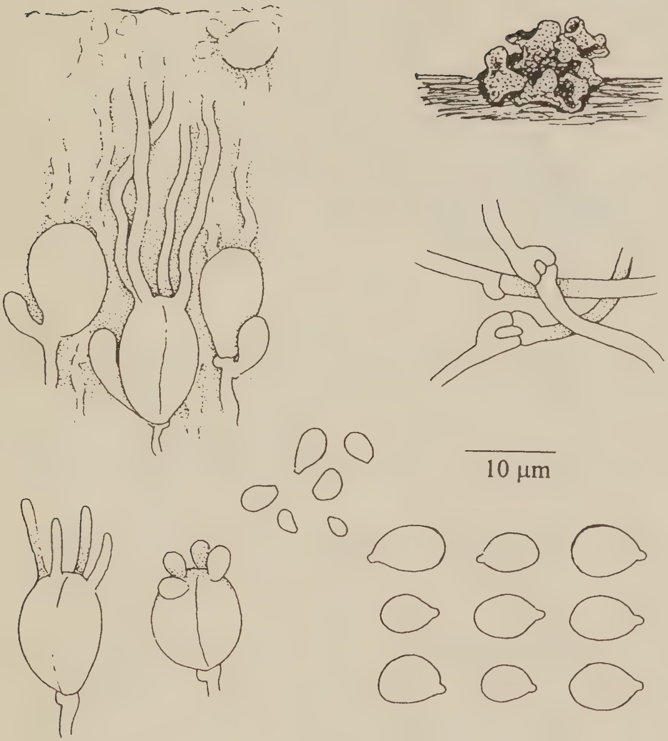


Fig. 11. ***Tremella foliacea***. Section of hymenium showing basidia, fruit body (natural size), context hyphae, basidia (one producing conidiospores), conidiospores, basidiospores (de Meijer 906).

basidiospores, and comparatively narrow hyphae. *T. auricularia* is similarly coloured, but has much larger basidia and spores; *T. wrightii* is also brown, but has inflated, cartilaginous, horn-like lobes, a very dense gelatinous matrix, and rather different basidia and basidiospores.

The specimen cited above was originally determined as *T. fimbriata* by B. Lowy (1988, in litt. to A.dM).

Tremella fuciformis Berk., *J. Bot. & Kew Misc.* 8: 277 (1856) (Fig. 12)

Fruit body gelatinous, up to 80 mm across, foliaceous, often densely so, the fronds thin but erect, not lax, markedly crisped and waved at margins, closely and irregularly branched, watery white to off-white, in older specimens becoming ochraceous to brownish in basal parts. *Hyphae* hyaline, in a dense gelatinous matrix, mostly 2 - 3.5 µm wide, occasionally wider in older parts of the context, thin-walled, with clamp connexions. *Haustorial cells* not seen. *Conidiophores* not seen. *Basidia* 4-celled, clavate to ellipsoid, 6.5 - 8 (- 12) µm wide, with oblique to vertical septa; sterile surfaces often have an abortive hymenial layer composed of swollen globose to irregular cells up to 20 µm wide, often catenulate, often with slightly gelatinized walls. *Basidiospores* ellipsoid (Q = 1.4 - 1.7), 5 - 6.5 (- 9) x 4 - 4.5 (- 7) µm.

Specimens examined: **BRAZIL, Paraná State:** Paranaguá, Ilha do Mel, *res*, on coppiced wood, 6 May 1989, de Meijer PAa-1244, **K(M) 39549**; Paranaguá, Guaraguaçu, Fazenda Sambaqui, *dof*, on decayed wood, 26 May 1996, de Meijer PAd-3383, **Herb AdM**; São Mateus do Sul, *mof*, on decayed branch, 23 May 1990, de Meijer SM-1766, **Herb. AdM**; **São Paulo State:** Itu, Fazenda São Miguel, *gal*, on decayed branch, 10 Jan. 1987, de Meijer IT-720, **K(M) 39551**; same location and substrate, *gal*, 21 Jun. 1990, de Meijer IT-1827, **K(M) 39550 & Herb. AdM.**

Tremella fuciformis was originally described from Brazil, but is a common pantropical species, cultivated for food in the Far East. It can generally be recognized on sight, thanks to its pure white, densely foliaceous fruit bodies. Microscopically, the highly gelatinized context together with the small basidia and basidiospores are distinctive. All specimens examined also have aborted hymenial layers on old or sterile surfaces containing chains of highly swollen, globose cells; similar aborted layers are occasionally found in other *Tremella* species, but seem to be particularly common and possibly consistently present in *T. fuciformis*.

The specimen de Meijer 1766 is underdeveloped, sparsely lobed, and was mistaken in the field for *T. fibulifera.* Microscopically, however, it is typical *T. fuciformis.* The specimen de Meijer 3383 is parasitized by a stalked conidial fungus which covers the entire *Tremella* fruit body with short brown spines. The parasite is non-basidiomycetous and has not been investigated further.

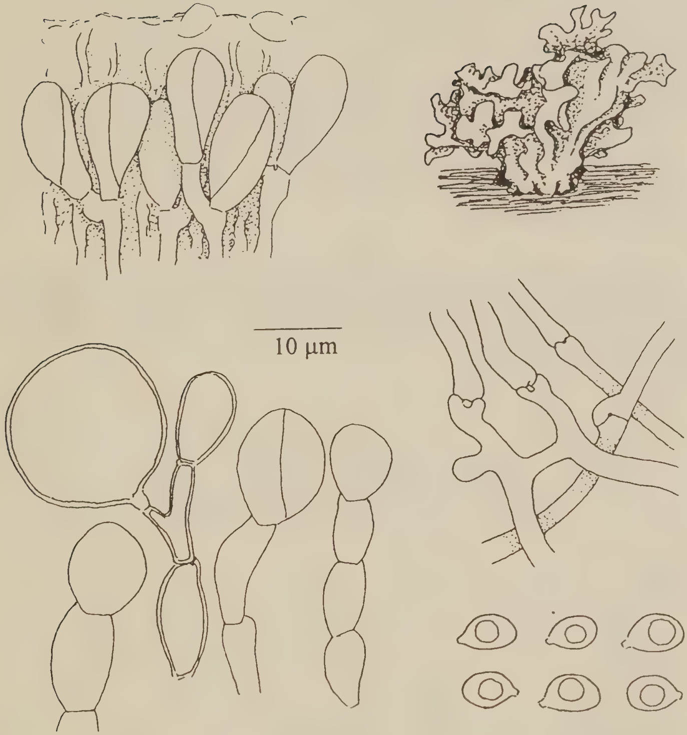


Fig. 12. ***Tremella fuciformis***. Hymenial section showing basidia, fruit body (natural size), inflated cells (aborted basidia) on sterile surfaces, context hyphae, basidiospores (de Meijer 1244).

Tremella wrightii Berk. & Curt., *J. Linn. Soc. Bot.* 10: 341(1868) (Figs. 13 & 14)

Fruit body firm-gelatinous, lobed to foliaceous, 30 mm across, up to 20 mm in height, with erect, inflated, antler or finger-like processes, light brown [6-7D5], paler at extremities, drying almost black. *Hyphae* in a dense gelatinous matrix, most 2 - 3 µm wide in context, some irregularly inflated up to 6.5 µm wide, particularly in the subhymenium, with clamp connexions. Anastomoses common in the hymenium between sub-basidial hyphae. *Haustorial cells* not seen. *Conidiophores* not seen. *Basidia* 4-celled, subglobose to ellipsoid, 9 - 11 (- 13) µm wide, with diagonal to vertical septa. *Basidiospores* ellipsoid (Q = 1.2 - 1.4), 5.5 - 7.5 (- 9) x 4 - 6 µm, germination not seen.

Specimens examined: **BRAZIL, Paraná State**: Parque Marumbi, *dof*, on decayed trunk, 6 Feb. 1993, de Meijer MA-2447, **K(M) 39546 & Herb. AdM; São Paulo State**: Itu, Fazenda São Miguel, *gal*, on dead branch, 15 Jul. 1987, de Meijer IT-858, **K(M) 39547 & Herb. AdM; CUBA**: on sticks, Dec., Wright 194 (ex herb. Berkeley), **K(M) 36621**, holotype.

Tremella wrightii should be recognizable in the field by its curious, inflated, horn-like processes and variously brown colouring. Microscopically it is similar to *T. foliacea*, having small basidia and

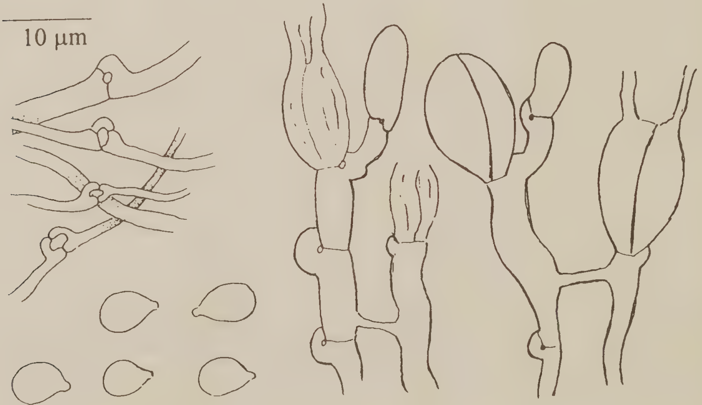


Fig. 13. ***Tremella wrightii***. Basidia and sub-basidial hyphae, context hyphae, basidiospores (Wright 194, holotype).

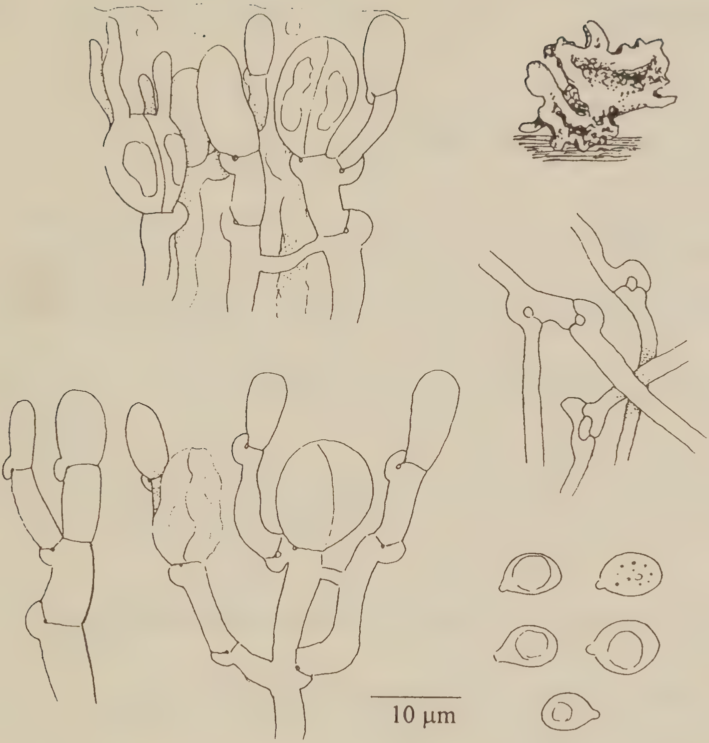


Fig. 14. ***Tremella wrightii***. Hymenial section showing basidia, fruit body (natural size), basidia, context hyphae, basidiospores (de Meijer 2447).

ellipsoid spores, but in *T. wrightii* a proportion of the hyphae are wider or irregularly inflated, and anastomoses joining adjacent sub-basidial hyphae (not seen in *T. foliacea*) are common in the hymenium. The specimen de Meijer 858 was also determined by B. Lowy (1988, in litt. to A.dM) as *T. wrightii*.

Species	Fruit.	Alt. (100m)	Frequency	Vegetation types
Sirobasidium rubrofuscum	2	8-9	RR (1x)	saf
Tremella aurantia	9	8-9	?C (1x)	saf, ?dof, ?mof
Tremella auricularia	10-6	6-10	CC	dof, mof, plp, ?gal
Tremella brasiliensis	1-12	0-15	CC	dof, mof, res
Tremella dysenterica	2-5	0-9	CC	dof, saf, ssf
Tremella fibulifera	12-7	0-8	CC	dof
Tremella foliacea	10	15	RR (1x)	dof
Tremella fuciformis	11-7	0-7	CC	dof, gal, mof, res, ssf
Tremella wrightii	1-7	0-9	C	dof, gal, mof, ssf

Table 1. Fruiting periods, altitude range, frequency, and habitats (vegetation types) of *Tremella* and *Sirobasidium* species in Paraná State. Abbreviations and symbols: **Fruit** = months (1-12) during which fruit bodies have been found in Paraná State. **Alt. (100m)** = altitude range in units of 100m (highest point in Paraná State is 1850m). **Frequency** in Paraná State: RR = very rare (1x = found only once); R = rare; C = uncommon to fairly common; CC = common. **Vegetation types** (following Veloso & Goés Filho, 1982): dof = dense ombrophilous forest; gal = gallery forest in savanna area; mof = mixed ombrophilous forest; plp = *Pinus* plantation; res = 'restinga' forest (on marine sands); saf = seasonal semi-deciduous alluvial forest; ssf = seasonal semi-deciduous submontane-montane forest

KEY TO TREMELLA SPECIES RECORDED FROM PARANÁ STATE

1. Fruit bodies mostly white to yellow to orange-red............................2
1. Fruit bodies mostly brown to blackish..6

2. Basidia very large, 21 - 33 µm wide; basidospores globose, 14 - 16 µm ....***Tremella brasiliensis***
2. Basidia and basidospores smaller..3

3. Unclamped host hyphae (*Stereum*) present in the fruit body; most basidia distinctly stalked; fruit body yellow to ochraceous.................. ....***Tremella aurantia***
3. All hyphae with clamp connexions; basidia not distinctly stalked.........4

4. Fruit body yellow to orange-red..........................***Tremella dysenterica***
4. Fruit body mostly whitish...5

5. Fruit body normally foliaceous, erect, cartilaginous; most basidiospores 5 - 6.5 µm long; most basidia 6.5 - 8 µm wide........***Tremella fuciformis***
5. Fruit body normally lobate, pustular, soft; most basidospores 8 - 9 µm long; most basidia 11-15 µm wide..........................***Tremella fibulifera***

6. Basidia 13 - 18 µm wide; basidiospores 11 - 13 µm long; fruit body normally ear-shaped or weakly foliaceous..............***Tremella auricularia***
6. Basidia and basidiospores smaller; fruit body normally strongly foliaceous or with antler-like processes..7

7. Fruit body with inflated fronds and antler-like processes; hyphal anastomosis common in hymenium..........................***Tremella wrightii***
7. Fruit body with thin, non-inflated fronds; hyphal anastomosis not present in hymenium...***Tremella foliacea***

Thanks to Prof. Leif Ryvarden for kindly reviewing this paper.

REFERENCES

Bandoni, R.J. (1958). Some tremellaceous fungi in the C.G. Lloyd collection. *Lloydia* 21: 137-151

Bandoni, R.J. & Oberwinkler, F. (1983). On some species of *Tremella* described by Alfred Möller. *Mycologia* 75: 854-863

Kornerup, A. & Wanscher, J.H. (1978). Methuen handbook of colour (3rd ed.). London

Lowy, B. (1971). Flora Neotropica 6: *Tremellales*. New York: Hafner

Lowy, B. (1980). Flora Neotropica 6 (supplement): *Tremellales*. New York Botanical Garden

McNabb, R.F.R. (1973). Taxonomic studies in the *Dacrymycetaceae* VIII. *Dacrymyces*. *New Zealand Journal of Botany* 11: 461-524

Möller, A. (1895). *Protobasidiomyceten*. Jena: Gustav Fischer Verlag

Roberts, P. (1995). British *Tremella* species I: *Tremella aurantia* & *T. mesenterica*. *Mycologist* 9: 110-114

Veloso, H.P. & Goés-Filho, L. (1982). Fitogeografia brasileira; classificação fisionômica-ecologica da vegetação neotropical. *Boletim Técnico do Projeto RADAMBRASIL, ser. Vegetação* 1

MYCOTAXON

Volume LXIV, pp. 285-301 September 1997

NON-PILEATE POLYPORES ON SANTA CATARINA ISLAND, SC, BRAZIL

CLARICE LOGUERCIO LEITE
ALEXANDRA LEHMKUHL GERBER

Laboratório de Micologia, Departamento de Botânica
Universidade Federal de Santa Catarina / Centro de Ciências Biológicas
88040-900, Florianópolis, SC, Brasil.

ABSTRACT

Fourteen non-pileate xylophilous species were found in Santa Catarina Island (Southern Brazil), thirteen are white rotters, only ***Antrodia albida*** (Fr.) Donk is a brown rotter. Key to and comments on the species are presented. ***Elmerina caryae*** (Schw.) Reid is new to Brazil.

KEY WORDS: non-pileate, polypores, xylophilous, wood rotters.

INTRODUCTION

The study of wood-rotting fungi is fundamental to understanding fungal diversity. Our study focused on the Atlantic Rain Forest localized on Santa Catarina Island (27°10' and 27° 30' S lat. and 48°25'and 48°35'W long.). A preliminary survey of these fungi showed that many species appear macromorphologically identical in the field (Loguercio-Leite & Wright, 1991). About 90% of them are lignocellulolytic, supporting Nobles (1965, 1971) hypothesis that white rots are generally found in Angiosperms.

Understanding the degradative role of these organisms in the recycling of wood and wood debris in forests, whether used or not by man, necessarily involves a concentrated effort on the biology of these organisms. We would like to stress the importance of doing previous survey of the mycota in this area, in order to allow more advanced studies in wood-rotters.

MATERIAL AND METHODS

The study of basidiomes, collected in the area, included recording their macro and microscopic characteristics (reproductive and vegetative structures). They were freehand sectioned and stained with 1% phloxine, 5% KOH and Melzer's reagent. Drawings were made with a camera lucida. Herbaria abbreviations follow Holmgren & Keuken (1974).

RESULTS AND CONCLUSIONS

The analysis of collections and materials previously deposited in herbaria, resulted in the identification of the following species: ***Antrodia albida, Ceriporia mellea, C. xylostromatoides, Ceriporiopsis pannocincta, Dichomitus anoectoporus, Elmerina caryae, Junghuhnia polycystidifera, J. vincta, Megasporoporia cavernulosa, Pachykytospora alabamae, P. papyracea, Perenniporia medulla-panis, Schizopora flavipora*** and ***S. paradoxa***.

KEY

1 . Spores only cylindrical, over 7.2 µm 2
1'. Spores various shapes, up to 7.2 µm 6

2 . Spores ornamented, slightly echinulate 3
2'. Spores smooth 4

3 . Pores 4-5 per mm; spores 9-14 x 3-5 µm .... ***Pachykytospora alabamae***
3'. Pores 2-4 per mm; spores (12.5-)13-15.5 x 5-6.5 µm ...... ***Pachykytospora papyracea***

4 . Hyphal system trimitic, vegetative hyphae dextrinoid . ***Megasporoporia cavernulosa***
4'. Hyphal system dimitic, vegetative hyphae non-dextrinoid 5

5 . Brown rot; spores 7.2-11 x 2.5-6 µm .... ***Antrodia albida***
5'. White rot; spores 15.5-21.6 x 5-6.1 µm .... ***Dichomitus anoectoporus***

6 . Pore surface pinkish to reddish brown when dry, cruciately septate basidia; spores cylindrical-allantoid, 5.5-7 x 2.5-3(-3.5) .... ***Elmerina caryae***
6'. Pore surface white, cream to yellowish; homobasidia; spores different 7

7 . Spores thick-walled, broadly ellipsoid to ovoid, usually truncate, 5-6 x 4-5(-5.5) µm; vegetative hyphae and spores variable dextrinoid .. ***Perenniporia medulla-panis***
7'. Spores thin-walled, vegetative hyphae and spores non-dextrinoid 8

8 . Hyphal system dimitic; thick-walled skeletal incrusted cystidia present 9
8'. Hyphal system monomitic; thick-walled skeletal incrusted cystidia absent 10

9. Spores cylindrical, 3.2-3.6 x 1.4-1.8 µm; generative hyphae always with clamps .... ***Junghuhnia polycystidifera***
9'. Spores subglobose, 2.9-4.3 x 2.5-3.2 µm; generative hyphae with simple septa and clamps .... ***Junghuhnia vincta***

10 . Generative hyphae with simple septa 11
10'. Genertive hyphae with clamps 12

11 . Pores 1-2 per mm; spores cylindrical, slightly allantoid, 6-7.2 x 2.5-4 µm; without cystidia ....***Ceriporia mellea***
11'. Pores 3-6 per mm; spores broadly ellipsoid to globose, (4-)4.3-5 x (3-)3.6-4(-4.3) µm; with claviform, thin-walled cystidia, strongly stained in cotton blue .... ***Ceriporia xylostromatoides***

12 . Spores allantoid, up to 1.1 µm wide .... ***Ceriporiopsis pannocincta***
12'. Sporos ellipsoid, wider than 2.5 µm 13

13 . Pores 3-8(-9) per mm; spores ellipsoid to subglobose, (2.9-)3.2-4.7 x 2.5-3.6 µm ....***Schizopora flavipora***
13'. Pores 2-4 per mm; spores ellipsoid to broadly ellipsoid, (4.7-)5-5.8 x 3.2-4.3 µm .... ***Schizopora paradoxa***

SPECIES

Antrodia albida (Fr.) Donk Fig. 1
Persoonia 4: 339, 1966.

Description in Gilbertson & Ryvarden, 1986.
Comments: The hymenophore is variable: irregularly poroid, laccerate to labyrinthform; the spores show a wide variation in size. The smooth spores 7.2 - 11 x 2.5 - 6 µm, help us to separate it from other species growing on decidous trees, causing a brown rot.
Voucher specimens: FLOR 10742 (BRAZIL, SC, Ilha de Santa Catarina, Parque Lagoa do Peri, Loguercio Leite & Furlani 431, 14/II/89); BAFC 31982 (TANZANIA, Arusha, Ryvarden 10031, 8/II/73).

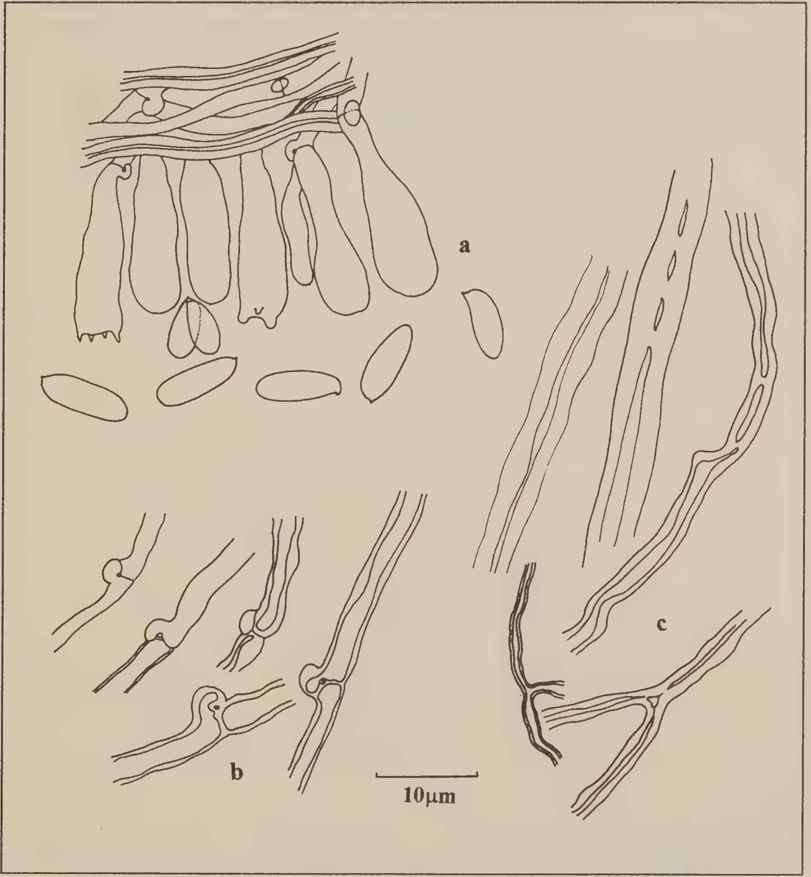


Fig. 1 - *Antrodia albida*: a. hymenium and basidiospores; b. generative hyphae; c. skeletal hyphae. (From FLOR 10742).

Ceriporia mellea (Berk. & Br.) Ryv. Fig. 2
Bull. Jard. Bot. Nat. Belg. 48: 98, 1978.

Description in Ryvarden & Johansen, 1980.
Comments: Absence of clamps and inamyloid spores were the features which led Ryvarden (1978) to transfer it to ***Ceriporia***. It is very close to ***Rigidoporus*** with the same hyphal system and type of basidiomes. Lowe (1963) pointed to the similarity among ***Poria chlorina*** Masse, ***C. reticulata*** (Pers.:Fr) Dom. and ***Ceriporia mellea***. Our material from ***C. mellea*** has cylindric, slightly allantoid spores 6 - 7.2 x 2.5 - 4 µm.
Voucher specimens: FLOR 10594 (BRAZIL, SC, Ilha de Santa Catarina, Morro da Lagoa da Conceição, Loguercio Leite & Furlani 158, 13/I/88); BAFC 31722 (ARGENTINA, Misiones, P. N. Iguazú, camino a Apepú, Ryvarden, 4/III/82).

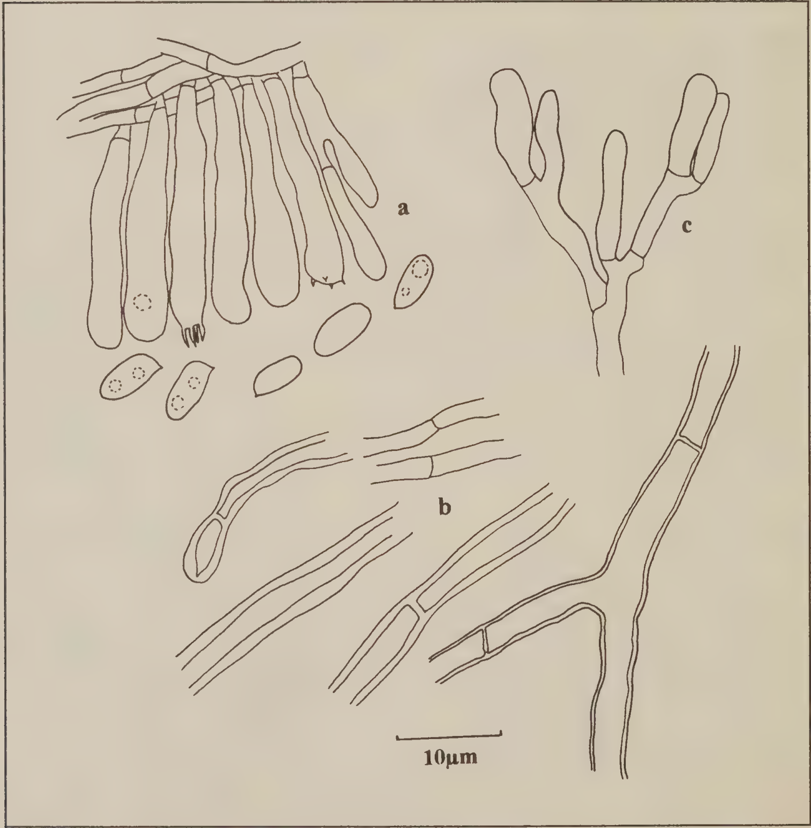


Fig. 2 - *Ceriporia mellea*: a. hymenium and basidiospores; b. generative hyphae; c. branched generative hyphae with young basidia. (From FLOR 10594).

Ceriporia xylostromatoides (Berk.) Ryv. & Johan. Fig. 3
Prelim. Polyp; Fl. East Africa, p. 276, 1980.

Description in Ryvarden & Johansen, 1980.
Comments: Our specimens are caracteristically resupinate (except one - FLOR 10710 - with little tendency to become reflexed) basidiomes and have cystidia, without papillae. David & Rajchenberg (1985) studied two African collections that had resupinate basidiomes and smooth cystidia, like our materials. Our material exhibits thin-walled, claviform, hymenial cystidia with 14.4 - 16.2 x 9 - 10 µm, simple-septate at the base, with contents that stain intensely with cotton blue. These cystidia, allied to monomitic hyphal system - with simple-septate generative hyphae, separate this species from the other ones cited in this article.
Voucher specimens: FLOR 10702, 10710 (BRAZIL, SC, Ilha de Santa Catarina, Ratones, Loguercio Leite & Furlani 383, 395, 27/I/89); BAFC 28774 (ARGENTINA, Misiones, Puerto Libertad, Alto Paraná, Rajchenberg, 24/XII/74).

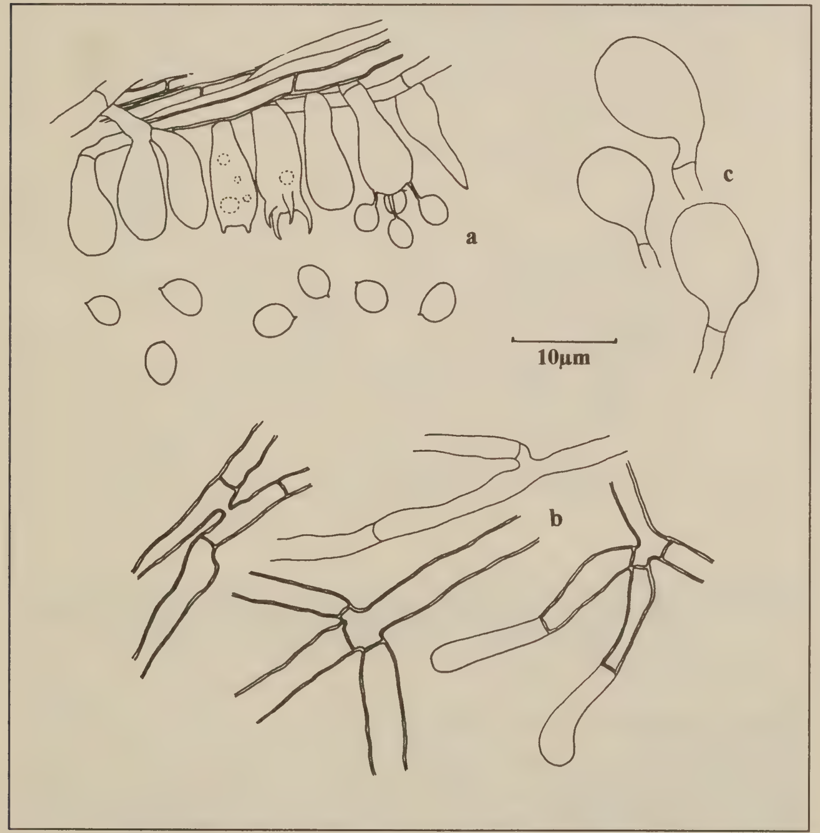


Fig. 3 - *Ceriporia xylostromatoides*: a. hymenium and basidiospores; b. generative hyphae; c. thin-walled cystidia. (From FLOR 10702).

Ceriporiopsis pannocincta (Rom.) Gilbn. & Ryv. Fig. 4
Mycotaxon 22: 364, 1985.

Description in Gilbertson & Ryvarden, 1986.
Comments: Spore allantoid (3.6 - 4 x 0.7 - 1.1 µm); fusiform cystidia, clamped hyphae and white rot characterize this species. The type of rot separates it from ***Oligoporus*** (brown rot). The resupinate basidiome separates it from the pileate ***Tyromyces***, however Kotlaba & Pouzar (1964) transferred it to ***Tyromyces***.
Voucher specimens: FLOR 10716 (BRAZIL, SC, Ilha de Santa Catarina, Rio Vermelho, Loguercio Leite & Furlani 401, 31/I/89); BAFC 31978 (USA, N. Y. State, Warrensburg, Lowe 2416, 6/IX/42).

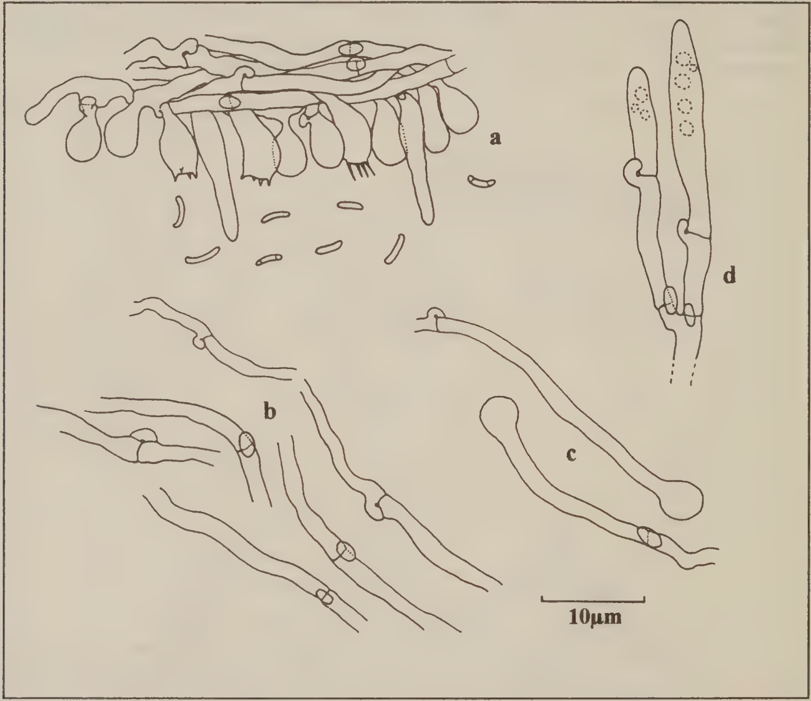


Fig. 4 - *Ceriporiopsis pannocincta*: a. hymenium and basidiospores; b. generative hyphae; c. tramal alocysts; d. branched generative hyphae with young basidia. (From FLOR 10716).

Dichomitus anoectoporus (Berk. & Curt.) Ryv. Fig. 5
Mycotaxon 20: 331, 1984.

Description in Lowe, 1966.
Comments: Large cylindric spores (15.5 - 21.6 x 5 - 6.1 µm) distinguish it from the other species here considered. The large pores (1 per mm) and lamellar surface, if the growth is on a vertical surface, are additional distinguishing features.

Voucher specimens: FLOR 10539 (BRAZIL, SC, Ilha de Santa Catarina, Morro da Lagoa da Conceição, Loguercio Leite & Furlani 79, 19/I/88); BAFC 31984 (BRAZIL, RS, Guaiba, Horto Florestal, Granja Carola, Susin 82, 20/XII/82).

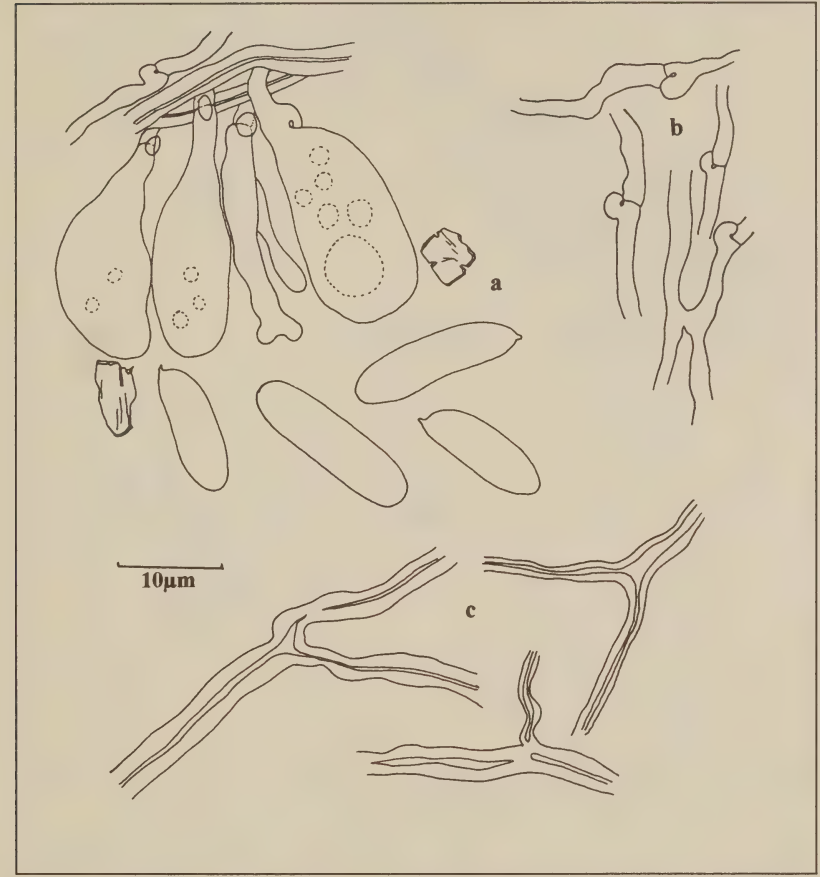


Fig. 5 - *Dichomitus anoectoporus*: a. hymenium and basidiospores; b. generative hyphae; c. branched skeletal hyphae. (From FLOR 10539).

Elmerina caryae (Schw.) Reid Fig. 6
Persoonia 14 (4): 471, 1992.

Description in Teixeira & Rogers, 1955; Reid 1992.
Comments: Macroscopically this is a "true polypore" very similar to other non-pileate basidiomes found in the forest. We can recognize them only microscopically by the cruciately septate basidia, difficult to find, mixed with homobasidioles. First record from Brazil.

Voucher specimens: FLOR 11327 (BRAZIL, SC, Ilha de Santa Catarina, Morro da Lagoa da Conceição, Gerber, Loguercio-Leite & Cabral 355, 23/II/94); BAFC 30138 (ARGENTINA, Misiones, P. N. Iguazú, ruta 101, Rajchenberg & Job M3742, 11/IV/84).

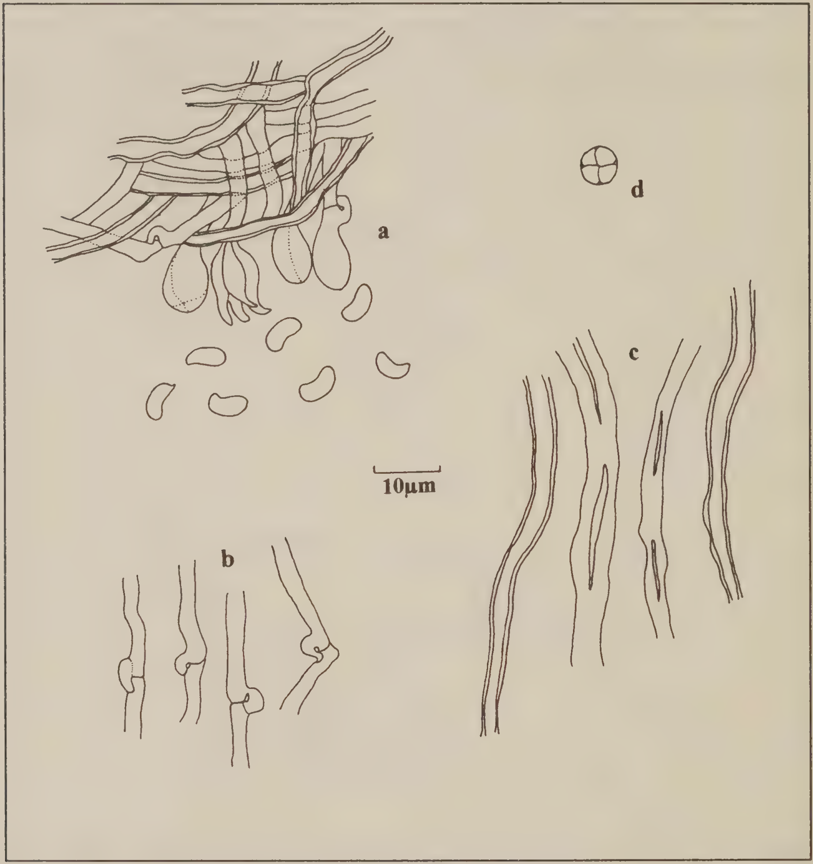


Fig. 6 - *Elmerina caryae*: a. hymenium and basidiospores; b. generative hyphae; c. skeletal hyphae; d. frontal view of basidia. (From BAFC 30138).

Junghuhnia polycystidifera (Rick) Rajch. Fig. 7
Nord. J. Bot. 7: 565, 1987.

Description in Rajchenberg, 1983 (like ***J. microspora*** Rajch.) .
Comments: The cylindric spores (3.2 - 3.6 x 1.4 - 1.8 μm) and small pores 5 - 9 per mm) distinguish it from the other treated in this study.
Voucher specimens: FLOR 10635 (BRAZIL, SC, Ilha de Santa Catarina, Parque Lagoa do Peri, Loguercio Leite & Furlani 253, 2/VIII/88); BAFC 30018 (ARGENTINA, Misiones, P. N. Iguazú, circuito inferior, Job & Rajchenberg M3556, 5/IV/84).

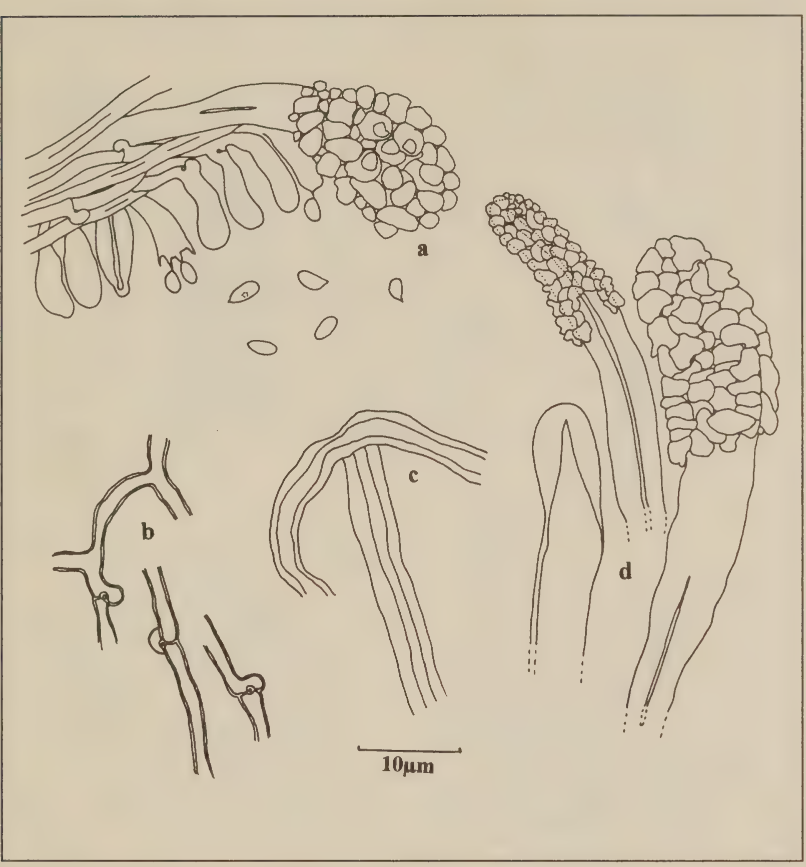


Fig. 7 - *Junghuhnia polycystidifera*: a. hymenium and basidiospores; b. generative hyphae; c. skeletal hyphae; d. cystidia. (From FLOR 10635).

Junghuhnia vincta (Berk.) Hood & Dick Fig.8
New Zeal. J. Bot. 26: 114, 1988.

Description in Hood & Dick, 1988.
Comments: In general this species is considered in ***Rigidoporus*** by the apparent absence of clamps in the basidiomes, but the cultures have them. We can observe presence of clamps on the young basidiomes and in the growth zones in the adult ones. They are localized always in the apex of thin-walled generatives, often the next septum is simple. The subglobose spores (2.9 - 4.3 x 2.5 - 3.2 µm) and the apparent absence of clamps are the distinctive aspects of this species.
Voucher specimens: FLOR 10542 (BRAZIL, SC, Ilha de Santa Catarina, Morro da Lagoa da Conceição, Loguercio Leite & Furlani 84, 19/I/88); BAFC 28023 (ARGENTINA, Misiones, Puerto Piray, 8 km E., Wright, Deschamps & Del Busto M2389, 26/X/73).

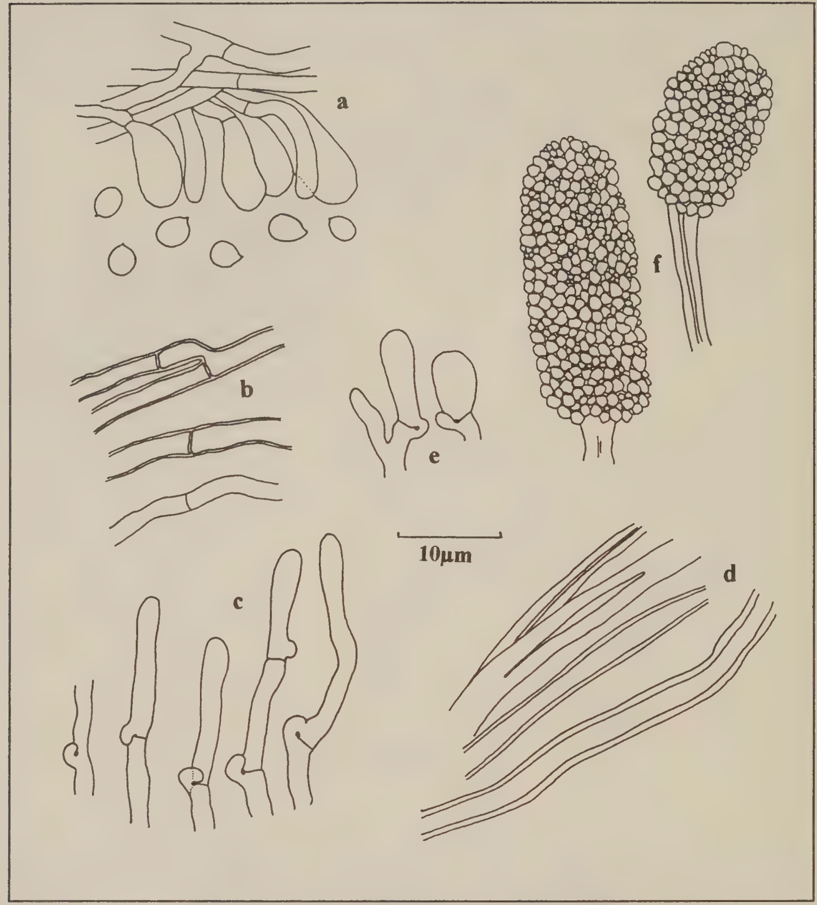


Fig. 8 - *Junghuhnia vincta*: a. hymenium and basidiospores; b. simple septate generative hyphae; c. clamped generative hyphae; d. skeletal hyphae; e. clamped basidioles; f. cystidia. (From FLOR 10542).

Megasporoporia cavernulosa (Berk.) Ryv. Fig. 9
Mycotaxon 16: 174, 1982

Description in Ryvarden, Wright & Rajchenberg, 1982.

Comments: Basidiomes cream to ochraceous, pores 2 - 4 per mm, dextrinoid skeletal hyphae, spores (9-) 10 - 13 x (3.2-) 3.6 - 4.7 µm and the dendrohyphidia are the characters that separate it from ***M. hexagonoides*** (Speg.) Wright & Rajch. (Ryvarden, Wright & Rajchenberg, 1982).

Voucher specimens: FLOR 10624 (BRAZIL, SC, Ilha de Santa Catarina, Morro da Lagoa da Conceição, Loguercio Leite & Furlani 236, 26/VII/88); BAFC 31983 (BRAZIL, AP, Serra do Navio, Rio Amapari, R. S. Cowan 38408, 17/IX/54).

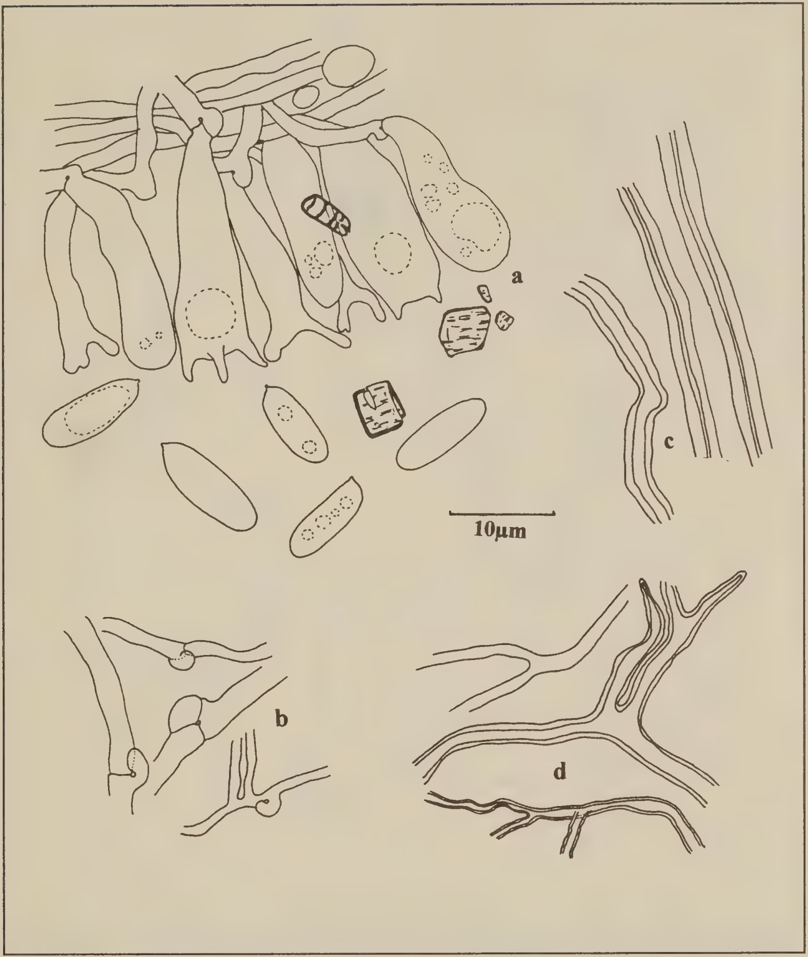


Fig. 9 - *Megasporoporia cavernulosa*: a. hymenium and basidiospores; b. generative hyphae; c. skeletal hyphae; d. binding hyphae. (From FLOR 10624).

Pachykytospora alabamae (Berk. & Cke.) Ryv. Fig. 10
Norw. J. Bot. 19: 233, 1972.

Description in Gilbertson & Ryvarden, 1987.
Comments: It is similar to ***P. papyracea***, but differs from it by narrower spores (3 - 5 µm) and 4 - 5 pores per mm. The delicate echinulate arrangement pattern of the spores is the more evident feature to separate it from other species.
Voucher specimens: FLOR 10629 (BRAZIL, SC, Ilha de Santa Catarina, Morro da Lagoa da Conceição, Loguercio Leite & Furlani 245, 26/VII/88); BAFC 30126 (ARGENTINA, Misiones, P. N. Iguazú, Wright, Rajchenberg & Job, 9/IV/84).

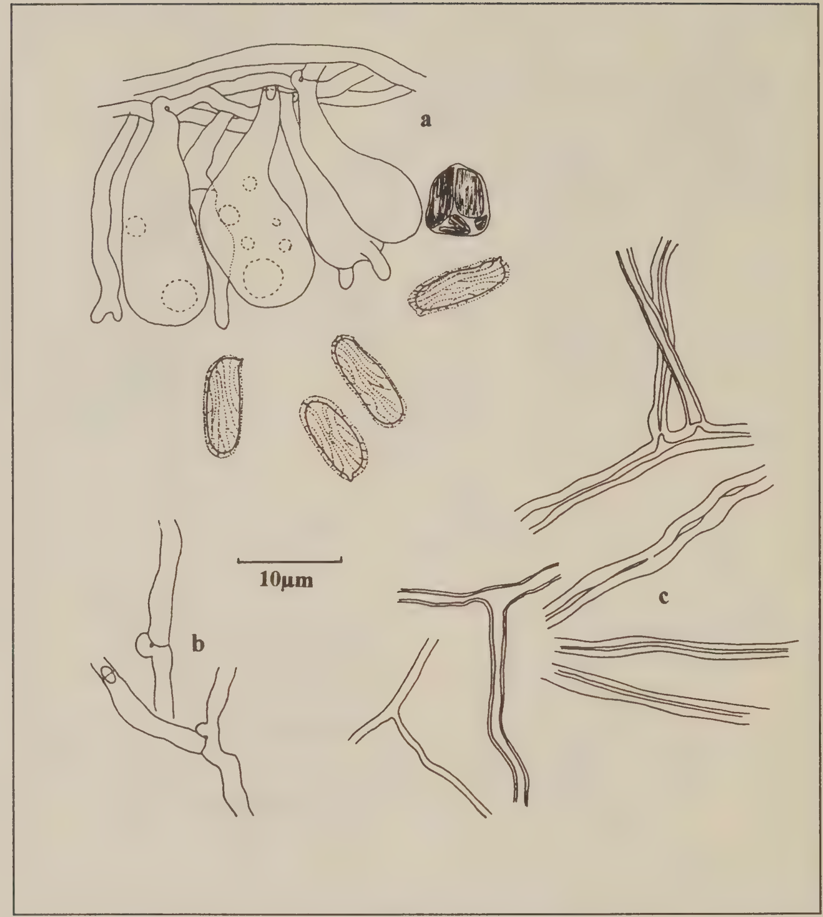


Fig. 10 - *Pachykytospora alabamae*: a. hymenium and basidiospores; b. generative hyphae; c. skeletal hyphae. (From FLOR 10629).

Pachykytospora papyracea (Schw.) Ryv. Fig. 11
Norw. J. Bot. 19: 233, 1972.

Description in Gilbertson & Ryvarden, 1987.

Comments: This species differs from ***P. alabamae*** by considerably larger basidiospores ((12.5-) 13 - 15.5 x 5 - 6.5) µm and larger pores (2 - 4 per mm). The basidiospores morphology is similar in shape and ornamentation.

Voucher specimens: FLOR 10931 (BRAZIL, SC, Ilha de Santa Catarina, Morro da Lagoa da Conceição, Gerber, Baptista & Cabral 247, 25/VI/93); BAFC 27143 (BRAZIL, RS, São Leopoldo, Rick 1907).

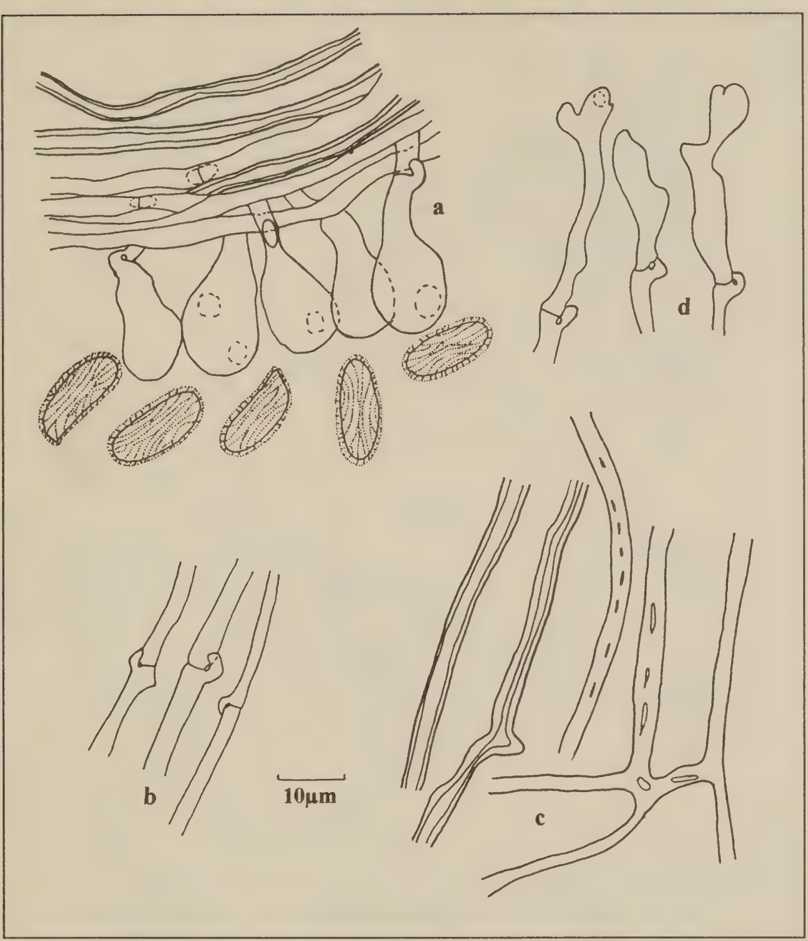


Fig. 11 - *Pachykytospora papyracea*: a. hymenium and basidiospores; b. generative hyphae; c. skeletal hyphae; d. dendrohyphidia. (From FLOR 11931).

Perenniporia medula-pannis (Jacq.: Fr.) Donk Fig. 12
Persoonia 5: 76, 1967.

Description in Ryvarden & Johansen, 1980.

Comments: The vegetative hyphae are variable dextrinoid, differing from European collections (Ryvarden & Johansen, 1980) in which the reaction is absent. The truncate thick-walled spores (5 - 6 x 4 - 5 (-5.5) µm) are usually weakly dextrinoid in our specimens.

Voucher specimens: FLOR 11201 (BRAZIL, SC, Ilha de Santa Catarina, Costeira do Ribeirão, Sítio do Jambo, Gerber 641, 21/V/95); BAFC 30234 (ARGENTINA, Buenos Aires. Magdalena, Estancia "El Destino", Rajchenberg & Job, 28/VIII/84).

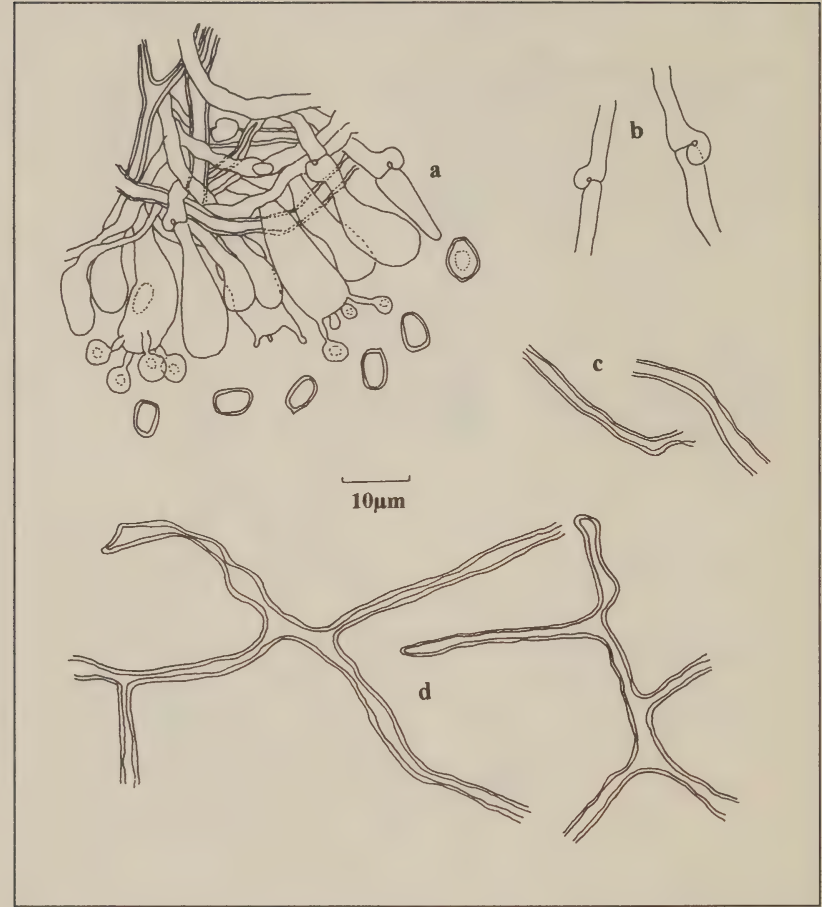


Fig. 12 - *Perenniporia medulla-panis*: a. hymenium and basidiospores; b. generative hyphae; c. skeletal hyphae; d. binding hyphae. (From FLOR 11201).

Schizopora flavipora (Berk. & Curt.) Ryv. Fig. 13
Mycotaxon 23: 186, 1985.

Description in Gilbertson & Ryvarden, 1987.
Comments: Small pores (4 - 8 (-9) per mm) in horizontal substrates, thin- and thick-walled generative hyphae, and the large number of basidiomes growing together, are good features to distinguish this species.
Voucher specimens: FLOR 10546 (BRAZIL, SC, Ilha de Santa Catarina, Lagoa do Peri, Loguercio Leite & Furlani 91, 22/I/88); BAFC 28133 (ARGENTINA, Buenos Aires, Campana, INTA - DE, M. Rajchenberg, 7/VII/79).

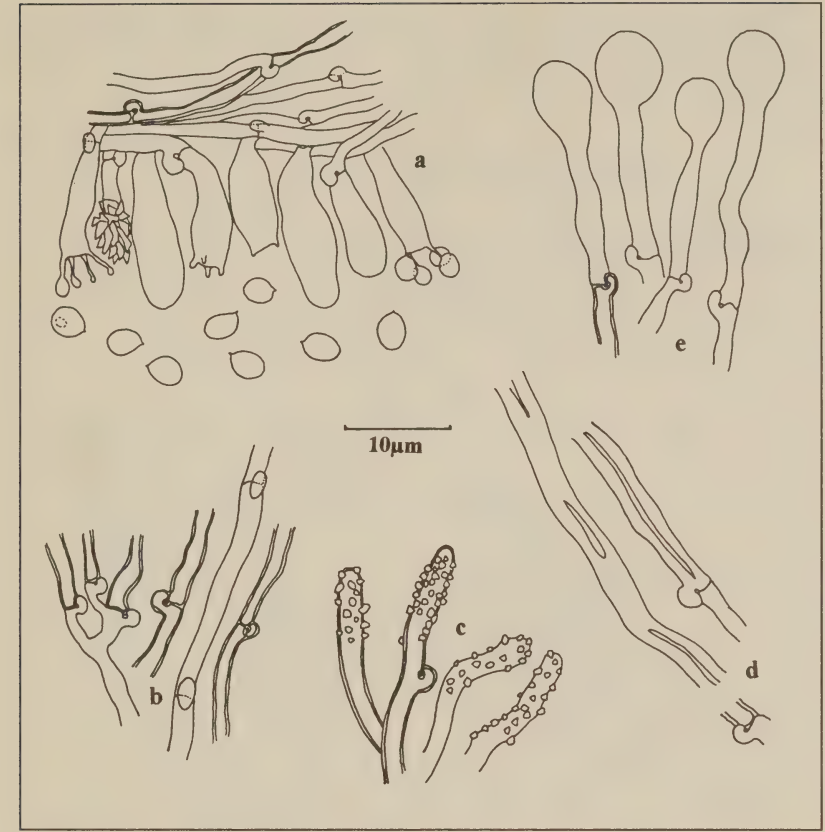


Fig. 13 - *Schizopora flavipora*: a. hymenium and basidiospores; b. generative hyphae; c. generative hyphae with incrusted apices; d. generative hyphae similar to skeletal hyphae; e. tramal alocysts. (From FLOR 10546).

Schizopora paradoxa (Fr.) Donk Fig. 14
Persoonia 5: 76, 1987.

Description in Gilbertson & Ryvarden, 1987.
Comments: The generally irregular, irpicoid to labyrinthiform hymenophore, flat on the margin and larger spores ((4.7-) 5 - 5.8 x 3.2 - 4.3 µm) are distinctive features separating it from ***S. flavipora***.
Both species are monomitic with clamped hyphae (Gilbertson & Ryvarden, 1987), have incrusted hyphae on the edge of dissepiments, hymenium covering the dissepiments, and cystidioles capitate or fusiform. Other authors, Donk (1967) and Hallenberg (1983) consider them dimitic, making the limits of this genus a motive of controversy, placing it in Corticiaceae, near ***Hyphodontia***.

Voucher specimens: FLOR 10724 (BRAZIL, SC, Ilha de Santa Catarina, Rio Vermelho, Loguercio Leite & Furlani 409, 31/I/89); BAFC 28084 (ARGENTINA, Buenos Aires, Ezeiza, M. Rajchenberg, s/d).

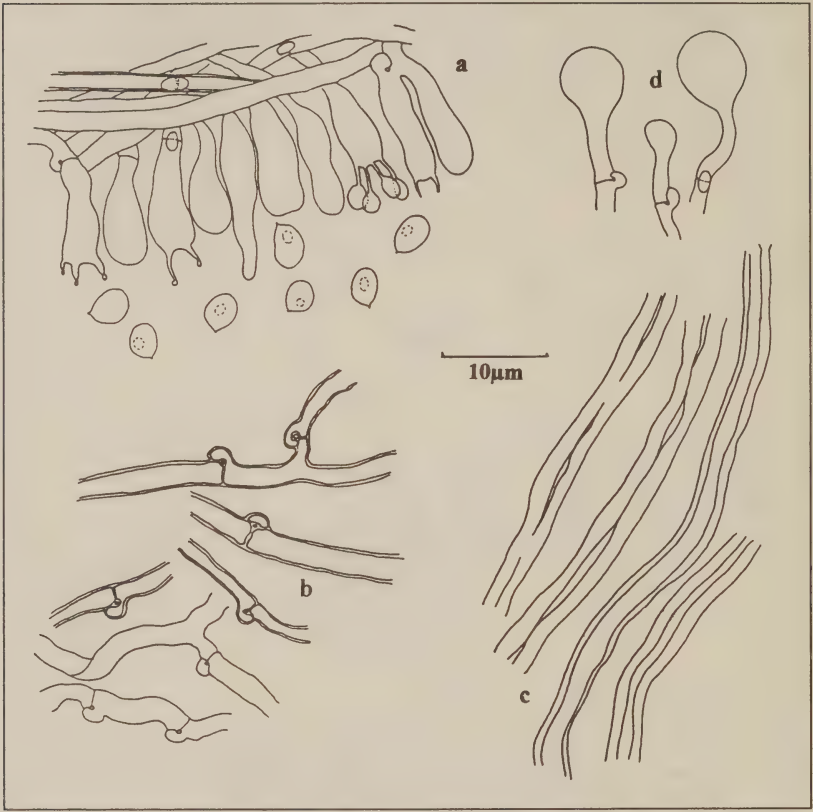


Fig. 14 - *Schizopora paradoxa*: a. hymenium and basidiospores; b. generative hyphae; c. generative hyphae similar to skeletal hyphae; e. tramal alocysts. (From FLOR 10724).

ACKNOWLEDGEMENTS

We are grateful to Dr. James Ginns (Ottawa, Canada) for the exhaustive review and invaluable criticism

REFERENCES

DAVID, A. & RAJCHENBERG, M. 1985. Pore fungi from French Antilles and Guiana. Mycotaxon 22(2): 285 - 325.

DONK, M. A. 1967. On European polypores - II. Persoonia 5(1): 47 - 130.

GILBERTSON, R. L. & RYVARDEN, L. 1986/87. North America polypores, vols. 1 and 2. Fungiflora, Oslo, Norway, 885 p.

HALLENBERG, N. 1983. On the *Schizopora paradoxa* complex. Mycotaxon 18(2): 303 - 314.

HOLMGREN, P. K. & KEUKEN, W. 1974. The Herbaria of the World in STAFLEU, F. A. Index Herbariorum, Pt. 1. Utrcht, Int. Bureau for Plant Taxonomy and Nomenclature. 6 ed., 397 p.

HOOD, I. A. & DICK, M. 1988. *Junghuhnia vincta* (Berk.) comb. nov., rot pathogen of *Pinus radiata* D. Don. New Zeal. Journ. Bot. 26: 113 - 116.

KOTLABA, F. & POUZAR, Z. 1964. A study of *Tyromyces pannocinctus* (Romell) comb. nov. Ceská Mykol. 18(2): 65 - 76

LOGUERCIO-LEITE, C. & WRIGHT, J. E. 1991. Contribution to a biogeographical study of the austro-american xylophilous polypores (Aphyllophorales) from Santa Catarina Island, SC., Brazil. Mycotaxon 41(1): 161 - 166.

LOWE, J. L.. 1963. A synopsis of *Poria* and similar fungi from the tropical regions of the world. Mycologia 55(4): 453 - 486.

-------------- . 1966. Polyporaceae of North America. The genus *Poria*. State Univ. N. Y. Coll. For. Tech. Publ. 90: 1 - 183.

NOBLES, M. 1965. Identification of cultures of wood inabiting Hymenomycetes Can. Journ. Bot. 43: 10097 - 1139.

---------------. 1971. Cultural characters as a guide of taxonomy of Polyporaceae. In: Petersen, R. Evolution in the higher Basidiomycetes. University of Tennessee Press. Knoxville. p. 169 - 96.

RACHJENBERG, M. 1983. New South American resupinates polypores. Mycotaxon 16 (2): 500 - 506.

REID, D. A. 1992. The genus *Elmerina* (Tremellales) with accounts of two species from Queensland, Australia. Persoonia 14(4): 465 - 474.

RYVARDEN, L. 1978. Studies in the Aphyllophorales of Africa 6. Some species from eastern Central Africa. Bull. Nat. Plantentuin Belg. 48: 79 - 117.

-------------- & JOHANSEN, I. 1980. A preliminary polypore flora of East Africa. Fungiflora, Oslo, Norway, 636 p.

--------------, WRIGHT, J. E. & RAJCHENBERG, M. 1982. *Megasporoporia*, a new genus of resupinate polypores. Mycotaxon 16: 172 - 182.

TEIXEIRA, A. R. & ROGERS, D. P. 1955. *Aporpium*, a polyporoid genus of the Tremellaceae. Mycologia 47: 408 - 415.

MYCOTAXON

Volume LXIV, pp. 303-319 September 1997

THE USTOMYCOTA: AN INVENTORY[*]

Robert Bauer and Franz Oberwinkler

Universität Tübingen, Lehrstuhl Spezielle Botanik und Mykologie, Auf der Morgenstelle 1, 72076 Tübingen, Germany

ABSTRACT

A recent paper by R. T. Moore proposes to include all simple septate basidiomycetes, except the rusts, in the Ustomycota. No evidence was found for Moore's concept of the Ustomycota, for the dichotomy between the simple septate basidiomycetes (excluding the rusts) on the one hand and the rusts and the complex septate basidiomycetes on the other, for Moore's differentiation between the Agaricostilbales and Atractiellales, for the inclusion of the Chionosphaeraceae, Pachnocybaceae and Camptobasidiaceae in the Atractiellales, for the erection of the family Camptobasidiaceae, for Moore's concept of the Platygloeales, for the inclusion of the Atractogloeaceae in the Septobasidiales, for the dichotomy of the Tilletiales between the Tilletiaceae and Doassansiaceae, for the tripartite classification of the Ustilaginales into the Ustilaginaceae, Microbotryaceae and Tilletiariaceae. The ustomycete terms are misleading. Among the life cycle features ascribed by Moore to the ustosporic Ustomycetes is a diplophase with mitotic nuclear divisions of the diploid nucleus between karyogamy in the teliospore and meiosis in the metabasidium; this diplophase is not documented. Sufficient data indicate that the Atractiellales contain only *Atractiella*, *Phleogena*, *Helicogloea* and *Saccoblastia*. The inclusion of *Camptobasidium* in the Atractiellales is inconsistent with Moore's concept of the Atractiellales. The diagnosis of

---

[*] Part 140 in the series *Studies in Heterobasidiomycetes* from the Botanical Institute, University of Tübingen.

the Atractiellaceae is also applicable for the Chionosphaeraceae. We disagree with Moore's description of the basidiospores of *Exobasidium*. The species of *Exobasidium* have ballistosporic basidiospores. The Graphiolales produce holobasidia in chains. Moore's interpretations concerning the Graphiolales are also inconsistent with his definitions of the ustomycete terms. *Mycosyrinx* differs significantly from the Graphiolales. We do not know valid descriptions of the Sporidiales and Sporidiaceae. *Bauhinus* is regarded as a synonym of *Microbotryum*. It is evident from the existing data that the species of *Schroeteria* are ascomycetous.

INTRODUCTION

Moore (1972) proposed the Ustomycota to separate the smut fungi from the basidiomycetes in a taxon of equal rank. The teliospore of the smut fungi was interpreted as an encysted proascus. In 1978, Moore created the superdivision Basidiomycotera to unite again the smut fungi with the basidiomycetes in a common taxon. Recently, Moore (1996) proposes to include all simple septate basidiomycetes except the rusts in the Ustomycota and suggests a dichotomy between the simple septate basidiomycetes (excluding the rusts) on one side and the rusts together with the complex septate basidiomycetes on the other. In the following we discuss some of Moore's (1996) statements and conclusions.

BASIS OF MOORE'S USTOMYCOTA

Moore (1996, p. 2) states that *"the ustomycetes have a number of characters that set them in contrast to the basidiomycetes proper. These species:*

A. are ordinarily dimorphic". Because many taxa of the Ustomycota are not dimorphic (e.g. *Atractiella*, *Phleogena*, *Herpobasidium*, *Helicobasidium*) and many basidiomycetous taxa outside the Ustomycota are dimorphic (e.g. the Tremellales) this feature may describe a trend, but it cannot be used as a marker of the Ustomycota. In addition, Moore himself does not consider the presence or absence of a yeast phase as a sufficient marker at higher taxonomic level. For example, he includes in both the Atractiellales and the Platygloeales organisms with and without yeast stages.

"... B. have diverse 5S rRNA but which does not occur in Walker's group 5". The rusts also do not occur in Walker's group 5 (Müller 1989).

"... C. have layered septa with nanopores". Moore suggests that the Ustomycetes have a distinctive septal pore type that separates them from the ascomycetes, rusts and the complex septate basidiomycetes. The uredinalian type of septal pore apparatus, however, is not restricted to the rusts. For example, the members of *Herpobasidium*, *Eocronartium* and *Saccoblastia* possess the same septal pore apparatus with a paraseptal cytoplasm delimited by microbodies (Boehm and McLaughlin 1989, Bauer and Oberwinkler 1994). A similar septal pore apparatus is also present in the unusual heterobasidiomycetous mycoparasite *Cryptomycocolax abnorme* Oberw. & Bauer except that the matrix surrounding the pore is delimited by microbodies and Woronin bodies (Oberwinkler and Bauer 1990). **Moore states that *"the ascomycetes have large pores".*** We have investigated numerous ascomycetes and found that many ascomycetes have large pores with large Woronin bodies and many have small pores with small Woronin bodies (for pore diameters of ascomycetes see also Moore and McAlear 1962, Rosing 1985, Kimbrough and Curry 1986). Throughout Moore's paper (1996), pore diameters are, in our opinion, over emphasized (e.g. the reported pore diameters among the species of the Platygloeales). Because ascomycetes have simple pores, the presence of simple pores appears to be a primitive character of the basidiomycetes. Therefore, simple pores cannot be used as a marker for a naturally circumscribed taxon within the basidiomycetes.

"... D. may have clamps". Taxa with and without clamps are scattered throughout both the Ustomycota sensu Moore (1996) and the Basidiomycota sensu Moore (1996). The rusts share the lack of clamps with their closest relatives, i.e., the *Herpobasidium* group, the Septobasidiales and the Pachnocybaceae (e.g. Bauer and Oberwinkler 1994, Berres et al. 1995, McLaughlin et al. 1995, unpubl. data).

"... E. may have lenticular bodies" or colacosomes. Moore (1972) found structures similar to lenticular bodies (Kreger-van Rij and Veenhuis 1971) in *Farysia olivacea* (= *Farysia thuemenii* (Fischer von Waldh.) Nannf. ?), *Tilletia foetida* (Wallr.) Liro (= *Tilletia laevis* Kühn), *Urocystis colchici* (Schlecht.) Rabenh. and *Ustilago nuda* (Jensen) Rostr.(= *Ustilago nuda* (Jensen) Kellerman & Swingle). We have investigated numerous smut fungi including these species and have not found lenticular bodies or colacosomes. In fact, only *Heterogastridium*, *Colacogloea*, *Rhodosporidium*, *Leucosporidium* and *Sporidiobolus* of the genera included by Moore (1996) in the Ustomycota possess colacosomes (Bauer and Oberwinkler 1991a, Oberwinkler et al. 1990, unpubl. data).

In summary, we could not find a substantial character, neither from the characters discussed by Moore (1996) nor from other published data, that sets the Ustomycota apart from the other basidiomycetes. On the contrary, that the Ustomycota sensu Moore (1996) cannot be separated from the other basidiomycetes is well supported by the general consensus of morphological, ultrastructural, molecular sequence and biochemical data (e.g. Oberwinkler 1982, 1985; Bandoni 1984; Müller 1989; Boehm and McLaughlin 1989; Bauer and Oberwinkler 1990, 1994; Prillinger et al. 1993; Swann and Taylor 1993, 1995; Berres et al. 1995; McLaughlin et al. 1995).

TERMINOLOGY

To support the taxon Ustomycota, Moore (1972, 1978, 1980, 1996) uses a terminology restricted to the Ustomycota. **Moore (1996, p. 2) states that *"the marked differences between the two basidiomycete phyla has engendered sets of analogous terms for the two taxa..."*.** In using Moore's terminology, for example, the rusts have basidia with basidiospores, whereas, e.g., *Herpobasidium* or the Septobasidiales have "ustidia" with "sporidia". There is no evidence that indicates that the basidia of the rusts and those of *Herpobasidium* or the Septobasidiales are fundamentally different or a result of convergent evolution. We think, these terms are misleading and unnecessary.

Moore (1996, p. 3) characterizes the "phragmoustidia" (= phragmobasidia) ***as developing "four or more parallel septa after meiosis".*** Using this definition, probably no member of Moore's Ustomycota has "phragmoustidia" (= phragmobasidia). Commonly, phragmobasidia have 3 parallel septa, occasionally also 2 septa or only one (see also 0'Donnell and McLaughlin 1984, Bauer et al. 1991, Berbee et al. 1991).

Moore (1996, p. 3-4) characterizes the "ustospores" (= teliospores) **as *"sexual spores formed from dikaryotic hyphae; initially binucleate, they become diploid by maturity. During germination the diploid nucleus may divide mitotically before it or a daughter nucleus moves into one or more metaustidia*** (= metabasidia) ***and undergoes meiosis; the diploid nucleus remaining in the spore may repeat the cycle (e.g., Nagler et al., 1990)."*** We do not know species in which mitotic nuclear divisions of the diploid nucleus occur between karyogamy in the teliospore ("ustospore") and meiosis in the metabasidium ("metaustidium") (e.g. see also 0'Donnell and McLaughlin 1984, Bauer et al. 1991, Berbee et al. 1991). In addition, we do not know published data in which this behaviour is described. Moore may have misinterpreted Nagler et al. (1990) who reported that "*the promycelium elongates and may attain a considerable length before the nucleus migrates from the spore into the promycelium. The first meiotic nuclear division takes place in the promycelium. After the division one nucleus remains in the promycelium, the other moves back to the spore*".

Moore (1996, fig. 2) suggests that there are two different types of life cycles in the Ustomycota. As discussed above, the "ustosporic" life cycle in which mitotic divisions of the diploid nucleus occur between karyogamy in the teliospore ("ustospore") and meiosis in the metabasidium ("metaustidium") is not documented. Thus, in both life cycles illustrated by Moore (1996) the "diplophase" is restricted to a diploid nucleus. Since teliospores ("ustospores") are thick-walled, resistant probasidia (Wells 1994), there is a difference in the basidial ontogeny among the members of the Ustomycota, but not a fundamental difference in the life cycle.

SOME COMMENTS ON THE PROFILES OF THE TAXA

Agaricostilbales and Atractiellales. **Moore (1996, p. 5) differentiates between the Atractiellales and Agaricostilbales as follows: the Atractiellales have "coremioid ustidiomes"** (= "coremioid" basidiomes) **bearing terminal heads of "phragmo- or holoustidia"** (= phragmo- or holobasidia), **hyphae efibulate ..., whereas the**

Agaricostilbales have stipitate, stilboid, capitate "ustidiomes" (= basidiomes). We do not know any substantial difference in basidiocarp morphology among these taxa, and the distinction of the "coremioid" versus stilboid fructification appears unwarranted. The species of *Agaricostilbum* as well as those of *Atractiella*, *Chionosphaera*, *Phleogena*, *Pachnocybe* and *Stilbum* develop stilboid basidiomes, occasionally with several heads per fructification. In addition, *Phleogena faginea* (Fr.) Link, a member of the Atractiellales, possesses clamps (Oberwinkler and Bandoni 1982a, Oberwinkler and Bauer 1989).

Moore (1996, p. 7) states that *"the order* (Atractiellales) ***comprises five families - Atractiellaceae and Camptobasidiaceae, ... - and brings together those saprobic genera that have coremioid ustidiomes*** (= "coremioid" basidiomes) ***bearing terminal heads of phragmo- or holoustidia*** (= phragmo- or holobasidia)*"*. As described by Marvanová and Suberkropp (1990), however, the basidia of *Camptobasidium hydrophilum* Marvanová and Suberkropp are scattered singly in the mycelial mat. There are no "coremioid" basidiomes bearing terminal heads of basidia (see also below).

Moore (1996, p. 7) states that *"the septa of Atractiella, Chionosphaera, Phleogena, Pachnocybe and Stilbum are similar to those found in Rhodosporidium toruloides and Leucosporidium scottii"* and cites Oberwinkler and Bauer (1989) among others for this statement. Oberwinkler and Bauer (1989), however, documented that the septal pore apparatus is variable among the stilboid taxa. Based on the septal pore ultrastructure and other characteristics they concluded that the Atractiellales are heterogeneous, and the stilboid basidiocarps may be a result of convergent evolution. Consequently, they emended the Atractiellales to include only taxa having symplechosomes (for symplechosomes see Bauer and Oberwinkler 1991b). These are: *Atractiella*, *Phleogena*, *Helicogloea* and *Saccoblastia*. We are not aware of new facts contradicting these data.

Atractiellaceae. **Moore (1996, p. 8) proposes the family Atractiellaceae**. Because Moore's definition of this taxon is also applicable to the Chionosphaeraceae Oberw. & Bandoni (see Oberwinkler and Bandoni 1982a, Oberwinkler and Bauer 1989), we consider the Atractiellaceae Moore as a synonym of Chionosphaeraceae Oberw. & Bandoni.

Camptobasidiaceae. **Moore (1996, p. 8) proposes also the Camptobasidiaceae to include *Camptobasidium hydrophilum* Marvanová & Suberkropp in the Atractiellales.** Marvanová and Suberkropp (1990) noticed *"that the characteristics of Camptobasidium hydrophilum merit the establishment of a new family preferably in the Atractiellales"*. However, Marvanová and Suberkropp (1990) also noticed "*that the taxonomic disposition of C. hydrophilum is in need of further study*". **Moore's diagnosis of the Camptobasidiaceae is as follows: "*Phylum Ustomycota. Ordo Atractiellales. ... basidia sparsa, singulatim ad hyphas, ...* ". Moore (1996, p. 5 and 7), however, characterizes the Atractiellales as having "coremioid ustidiomes"** (= "coremioid" basidiomes) **with terminal heads of "phragmo- or holoustidia"** (= phragmo- or holobasidia). Thus, the two diagnoses are contradictory. We agree with the view of Marvanová and Suberkropp (1990) *"that the taxonomic disposition of C. hydrophilum is in need of further studies*". As *C. hydrophilum*, for example, *Atractogloea stillata* Oberw. & Bandoni has clamps, transversely septate phragmobasidia with the production of passively released basidiospores and simple pores (Oberwinkler and Bandoni 1982b). *C. hydrophilum* differs from *A. stillata* in the presence of unusual conidia, but we do not consider that the presence or absence of conidia can be used as a marker at the family level. It is therefore possible, that *C. hydrophilum* is a member of the Atractogloeaceae. In addition, *C. hydrophilum* does not possess symplechosomes (unpubl. data). This fact indicates that this species is not a member of the Atractiellales.

Exobasidiales. **Moore (1996, p. 9) states that the species of *Exobasidium* "*develop no hilar appendix body or discharge droplet*".** Mims et al. (1987) reported that "*neither a hilar appendix body nor a hilar droplet was observed in Exobasidium*", but not that these structures are lacking. Hilar droplets are present for a very short time immediately before discharge (Webster et al. 1984). In addition, with electron microscope techniques they are difficult to demonstrate. For example, the droplet was not found in *Auricularia* species by McLaughlin et al. (1985) using electron microscopy but was demonstrated by light microscopy (Webster and Chien 1990). It is well known that the species of *Exobasidium* produce ballistosporic basidiospores. Therefore, Moore's statement requires an explanation and would consequently mean that the ballistosporic mechanism of *Exobasidium* and that of the other basidiomycetes is a result of convergent evolution. The ballistosporic mechanism is one of the strongest reasons for assuming a monophyletic origin of the basidiomycetes and for retaining them in a single taxon (Oberwinkler 1985). Therefore, Moore's statement would also mean that the species of *Exobasidium* are not basidiomycetous, but this is in contrast with all other data (e.g. see Oberwinkler 1982, 1985; Blanz and Gottschalk 1984, Prillinger et al. 1993).

Graphiolales. **Moore (1996, p. 10) states that in the Graphiolales *"karyogamy occurs part way up a series (ustospore initiation), followed by meiosis several cells later. Meiosis is followed by further nuclear divisions*** (logically mitotic divisions of haploid nuclei). ***Each ustospore*** (= teliospore) ***then buds a number of ustidia*** (= basidia - logically metabasidia, "metaustidia"). ***As an ustidium*** (= basidium) ***matures it becomes warty and thick-walled and divides to form a two-celled phragmoustidium*** (= phragmobasidium) **...**". Moore (1996), in disagreement with Oberwinkler et al. (1982) and his own definitions interprets the basidia, in which karyogamy and meiosis occur, as teliospores ("ustospores", inconsistent with his definition of the "ustospore", p. 3), the basidiospores as metabasidia ("metaustidia", inconsistent with his definition of the "metaustidia", p. 3) and the septate basidiospores as phragmobasidia ("phragmoustidia", inconsistent with his definition of the "phragmoustidia", p. 3). Using Moore's terminology, the "ustospore" (cell in which karyogamy occurs) of *Graphiola* is identical to the "metaustidium" (cell in which meiosis occurs). This is a contradiction in terms. As described by Oberwinkler et al. (1982), the Graphiolales have holobasidia and septate basidiospores, and teliospores are lacking. The Graphiolales share these characteristics with the Exobasidiales.

Mycosyrinx. **Moore (1996, p. 10) suggests that the genus *Mycosyrinx* belongs somehow to the Graphiolales.** He apparently interprets the teliospore pairs of *Mycosyrinx* as two-celled "phragmoustidia" (= phragmobasidia), thus comparing analogous structures. *Mycosyrinx* differs in all important features from *Graphiola*, e.g. basidia, sori, host range etc. (comp. Piepenbring and Bauer 1995, Vánky 1996). Therefore, we cannot imagine a connection between *Mycosyrinx* and the Graphiolales.

Platygloeales. Moore (1990) created the Platygloeales with *Platygloea* Schröter as type [type species: *Platygloea disciformis* (Fr.) Neuhoff]. The description of the order "***Divisio Ustomycota. Septum simplicibus, nondoliporus/parenthesomus; Auriculariaceae sensu Martin (1952) simile sed ustocarpus; sporidia formatus ex ustidia et germinantes repetitionis, unicellulas, vel micronemata*** (Moore 1990)" is unintelligible for us and may not be applicable to *Platygloea disciformis* (Aoki et al. 1986, Oberwinkler et al. 1990). Recent studies (e.g. Bauer and Oberwinkler 1994, Swann and Taylor 1995, Berres et al. 1995, McLaughlin et al. 1995) indicate that the taxa included by Moore (1996) in the Platygloeales, e.g., *Helicobasidium*, *Colacogloea*, *Platygloea*, *Kriegeria*, *Herpobasidium*, *Naohidea*, *Occultifur*, *Jola*, *Mycogloea*, *Neotyphula* and *Paraphelaria*, represent a heterogeneous assemblage. **Moore (1996, p. 11) states that the septal pore apparatus of *Herpobasidium filicinum* (Rostr.) Lind is similar to that of *Platygloea disciformis*** and cites among others Oberwinkler et al. (1990) and Bauer and Oberwinkler (1994) for this statement. However, these authors have shown that the septal pore apparatus of *H. filicinum* is of the uredinalian type (Bauer and Oberwinkler 1994), whereas that of *P. disciformis* is of the *Septobasidium* type (Oberwinkler et al. 1990). **Moore (1996, p. 11) states that *P. disciformis* has pore diameters ranging between about 28 nm and 300 nm**, data which are obviously taken from literature and which cannot be verified. As discussed by Oberwinkler et al. (1990), *P. disciformis* shows some features in common with the Septobasidiales that suggest a relationship. It differs from the Septobasidiales in the lack of a yeast phase and in the obvious lack of a scale insect association. As noticed by Aoki et al. (1986), this species appears to be closely related to *Platygloea navispora* Aoki & Tubaki and both stand well apart from all other taxa which have been placed in the genus *Platygloea*.

Septobasidiales. **Moore (1996, p. 13) ascribes the Atractogloeaceae to the Septobasidiales.** The septal pore apparatus of *Atractogloea stillata* Oberw. & Bandoni resembles that of the Septobasidiales and *Platygloea disciformis*, but the paraseptal electron opaque granules typical for the Septobasidiales are lacking (Oberwinkler and Bauer 1989, Oberwinkler et al. 1990, Bauer and Oberwinkler 1994). In addition, *Atractogloea stillata* differs from the Septobasidiales in the lack of a scale insect association, lack of ballistospores, presence of clamps, presence of aseptate basidiospores, cellular carbohydrate composition and in the spindle pole body morphology (Oberwinkler and Bauer 1989, Bauer and Oberwinkler 1990, Prillinger et al. 1993). These data indicate that the family Atractogloeaceae is not a member of the Septobasidiales.

Sporidiales. We do not know a valid description, neither of the Sporidiales nor of the Sporidiaceae. The name Sporidiales was introduced by Moore (1980, p. 365) without diagnosis and typification. The family Sporidiaceae is not based on a generic name and not typified (see Moore 1980, p. 371).

Tilletiales. **Moore (1996, p. 15), following Azbukina (1990), erects the Doassansiaceae and suggests a dichotomy of the Tilletiales between the species occurring predominantly on festucoid grasses (Tilletiaceae) and those occurring on paludal or aquatic plants (Doassansiaceae).** We are not aware of distinctive characters supporting these proposals.

Ustilaginales. **Moore (1996, p. 16) favors a classification of the Ustilaginales in a group occurring on monocots (Ustilaginaceae), a group occurring on dicots (Microbotryaceae) and a group that is not parasitic (Tilletiariaceae).** We do not know characters that support this tripartite subclassification of the Ustilaginales. Certainly, the data of Blanz and Gottschalk (1984), Deml (1987) and Müller (1989) show that *Microbotryum* and *Sphacelotheca* are distinct from *Ustilago* species occurring on monocots. However, only a few taxa of the phragmobasidiate smuts have been studied. Therefore, this statement appears premature. At present it is unknown whether there is a major dichotomy between the smuts infecting monocots and those infecting dicots. In addition, because *Tilletiaria anomala* Bandoni & Johri developed in a plate over which a polypore growing on decaying wood had been suspended (Bandoni and Johri 1972), nothing is known of it's life strategy.

Bauhinus and *Microbotryum*. **Moore (1992), using the data of Blanz and Gottschalk (1984) and Deml (1987), proposed *Bauhinus* to separate species of *Ustilago* occurring on dicots from *Ustilago*.** The description of *Bauhinus*, however, is also applicable to the species of *Microbotryum* and *Sphacelotheca* and does not separate *Bauhinus* from these genera (e.g. Blanz and Gottschalk 1984, Deml 1987, Prillinger et al. 1993). Therefore, Vánky (1993) considered *Bauhinus* to be a synonym of *Microbotryum*. **Moore (1996, p. 17) characterizes the species of *Bauhinus* as having persistent four-celled basidia and those of *Microbotryum* as forming deciduous basidia in which the upper three basidial segments separate from the teliospore acting as a propagule.** This suggested difference, however, is not stable. For example, *Microbotryum violaceo-irregulare* (Brandenburger & Schwinn) Deml & Oberw. occurring on Caryophyllaceae has persistent basidia, whereas *Ustilago intermedia* Schröter occurring on Dipsacaceae has deciduous basidia (Schmitter 1984). Currently, there is no consistent character that differentiates *Bauhinus* and separates the species of *Ustilago* occurring on dicots from *Microbotryum*. Therefore, we agree with Vánky (1993) that *Bauhinus* is a synonym of *Microbotryum* (see also Prillinger et al. 1991).

Schroeteria. **Moore (1996, p. 21) replaces the genus *Schroeteria* in the Ustilaginales.** Nagler et al. (1989) concluded that *Schroeteria delastrina* (L. & R. Tulasne) Winter and *Schroeteria poeltii* Vánky are ascomycetes. This conclusion was based on spindle pole body morphology and behaviour, septal pore ultrastucture, wall ultrastructure as well as on the presence of multinucleate hyphal cells, the lack of karyogamy and meiosis, the type of spore germination, the characteristics of the cultures and the type of conidial formation. **Moore's (1996, p. 21-22) criticism of Nagler et al. (1989) is as follows: - (i). *"The septa of both species have light-dark-light profiles..."*.** Some septa illustrated in Nagler et al. (1989) show a dark-light-dark profile, but definitely not a light-dark-light profile. In addition, it is known that wall composition (e.g. pigmented walls of sclerotia, fruiting bodies, chlamydospores), fixatives and also unknown factors influence the ultrastructural appearance of ascomycetous walls. For example, as is typical for ascomycetes the septal walls illustrated in Figs. 20 and 22 of Nagler et al. (1989) appear electron transparent, whereas the walls of soral hyphae which become chlamydospores are of medium electron opacity (Fig. 18 of Nagler et al. 1989). In addition, Moore and McAlear (1962, Fig. 1) and Moore (1980, Fig. 5b) illustrated ascomycetous septa with dark-light-dark profiles. Most walls illustrated in Nagler et al. (1989) appear electron-transparent with an electron-opaque outer layer, as is typical for ascomycetes. - **(ii). *"... have small***

pores ... and, in some micrographs, pulley-shaped occlusions; the pores are accompanied by small, membrane bounded granules". For the pore diameters of ascomycetes see above and Moore and McAlear (1962). Pulley-shaped occlusions do not exist in the pores illustrated by Nagler et al. (1989), but some pores are plugged by Woronin bodies (Markham 1994). Also Moore and McAlear (1962, Fig. 1) illustrated a similar pore occlusion of the ascomycete *Mollisia* sp. Moore names the Woronin bodies, illustrated in Figs. 19-22 of Nagler et al. (1989), "membrane bounded granules". We have seen numerous Woronin bodies in diverse ascomycetes and can verify the identity of the pore associated bodies in *Schroeteria* with Woronin bodies. - (iii). "***The authors, disregarding habit, gross- and micromorphology, and the general consensus that this is a natural, well delimited genus of smuts (Vánky 1981)...***". Spore germination of different species of *Schroeteria* has been described and illustrated, e.g., by Winter (1876), Schröter (1877), Brefeld (1883), De Toni (1888), Vánky (1968, 1981), Durán (1972) and Nagler et al. (1989). These authors found the same type of germination with the production of globose "sporidia" (= conidia), often arranged in chains. In culture, Brefeld (1883) noted also sclerotium-like bodies without fructification. On this basis, Brefeld (1883) and Lindau (1912) supposed that the genus *Schroeteria* belongs to the ascomycetes. Nagler et al. (1989), based on detailed studies noted above, found unquestionable ascomycetous characters in *Schroeteria*. Vánky (1994) adopted these results and excluded *Schroeteria* from the Ustilaginales. The sole report contradicting these observations is the *Ustilago*-type of germination of supposed spores of *Schroeteria delastrina*, described and illustrated by Thirumalachar and Whitehead (1968). Moore (1996) favors the single report of Thirumalachar and Whitehead (1968) and disregards the general consensus of the other, well documented reports.

ACKNOWLEDGEMENTS

We thank Dominik Begerow, Dr. Kálmán Vánky and Michael Weiß for critically reading the manuscript, and the Drs. Robert J. Bandoni, David J. McLaughlin, John W. Taylor and Kenneth Wells for reviewing the manuscript.

REFERENCES

Aoki, T., Tubaki, K., and Bandoni, R. J. 1986. On two unreported species of *Platygloea* from Japan. Trans. mycol. Soc. Japan **27**: 371-385.

Azbukina, Z. M. 1990. O statuse doassansioidnykh rodov v sisteme golovnevykh. IN L. N. Vasilèva, Z. M. Azbukina & L. N. Egorova (eds.) Kriptogamicheskie Issledovaniya na Dal'nem Vostoke, pp. 106-108. Akademiya Nauk SSSR: Vladivostok.

Bandoni, R. J. 1984. The Tremellales and Auriculariales: an alternative classification. Trans. mycol. Soc. Japan 25: 489-530.

Bandoni, R. J., and Johri, B. N. 1972. *Tilletiaria*: a new genus in the Ustilaginales. Can. J. Bot. **50**: 39-43.

Bauer, R., and Oberwinkler, F. 1990. Meiosis, spindle pole body cycle and taxonomy of the heterobasidiomycete *Pachnocybe ferruginea*. Pl. Syst. Evol. **172**: 241-261.

Bauer, R., and Oberwinkler, F. 1991a. The colacosomes: new structures at the host-parasite interface of a mycoparasitic basidiomycete. Bot. Acta **104**: 53-57.

Bauer, R., and Oberwinkler, F. 1991b. The symplechosome: a unique cell organelle of some basidiomycetes. Bot. Acta **104**: 93-97.

Bauer, R., and Oberwinkler, F. 1994. Meiosis, septal pore architecture, and systematic position of the heterobasidiomycetous fern parasite *Herpobasidium filicinum*. Can. J. Bot. 72: 1229-1242.

Bauer, R., Berbee, M. L., and Oberwinkler, F. 1991. An electron microscopic study of meiosis and the spindle pole body cycle in the smut fungus *Sphacelotheca polygoni-serrulati*. Can. J. Bot. **69**: 245-255.

Berbee, M. L., Bauer, R., and Oberwinkler, F. 1991. The spindle pole body cycle, meiosis, and basidial cytology of the smut fungus *Microbotryum violaceum*. Can. J. Bot. **69**: 1795-1803.

Berres, M. E., Szabo, L. J., and McLaughlin, D. J. 1995. Phylogenetic relationship in auriculariaceous basidiomycetes based on 25S ribosomal DNA sequences. Myologia **87:** 821-840.

Blanz, P. A., and Gottschalk, M. 1984. A comparison of 5S ribosomal nucleotide sequences from smut fungi. Syst. Appl. Microbiol. **5**: 518-526.

Boehm, E. W. A., and McLaughlin, D. J. 1989. Phylogeny and ultrastructure in *Eocronartium muscicola*: meiosis and basidial development. Mycologia **81**: 98-114.

Brefeld, O. 1883. Untersuchungen aus dem Gesammtgebiete der Mykologie. Arthur Felix, Leipzig. 220p. + XIII Tafeln. V. Band: 138 ff. + Taf. XI, XII.

Deml, G. 1987. Taxonomy of phragmobasidial smut fungi. Stud. Mycol. **30**: 127-135.

De Toni, J. B. 1888. Ustilaginaceae Tul. IN P. A. Saccardo (ed.), Sylloge Fungorum **7**: 449-527.

Durán, R. 1972. Aspects of teliospore germination in North American smut fungi. Can. J. Bot. **50**: 2569-2573.

Kimbrough, J. W. and Curry, K. J. 1986. Septal structures in apothecial tissues of the tribe Aleurieae in the Pyronemataceae (Pezizales, Ascomycetes). Mycologia **78**: 407-417.

Kreger-van Rij, N. J. W., and Veenhuis, M. 1971. Some features of the genus *Sporidiobolus* observed by electron microscopy. Antonie van Leeuwenhoek **37**: 253-255.

Lindau, G. 1912. Kryptogamenflora der Mark Brandenburg. Gebr. Bornträger, Leipzig. Bd. 5, Pilze 3, p. 65-67.

Markham, P. 1994. Occlusions of septal pores in filamentous fungi. Mycol. Res. **98**: 1089-1106.

Martin, G. W. 1952. Revision of the North Central Tremellales. Stud. Nat. History **19**: 1-122.

Marvanová, L., and Suberkropp, K. 1990. *Camptobasidium hydrophilum* and its anamorph, *Crucella subtilis*: a new heterobasidiomycete from streams. Mycologia **82**: 208-217.

McLaughlin, D. J., Beckett A., and Yoon, K. 1985. Ultrastructure and evolution of ballistosporic basidiospores. Bot. J. Linn. Soc. **91**: 253-271.

McLaughlin, D., J., Frieders, M., and Lü, H. 1995. A microcopist's view of heterobasidiomycete phylogeny. Stud. Mycol. 38: 91-109.

Mims, C. W, Richardson, E. A., and Roberson, R. W. 1987. Ultrastructure of basidium and basidiospore development in three species of the fungus *Exobasidium*. Can. J. Bot. **65**: 1236-1244.

Moore, R. T. 1972. Ustomycota, a new division of higher fungi. Antonie van Leeuwenhoek **38**: 567-584.

Moore, R. T. 1978. Taxonomic significance of septal ultrastructure with particular reference to the jelly fungi. Mycologia **70**: 1007-1024.

Moore, R. T. 1980. Taxonomic proposals for the classification of marine yeasts and other yeast-like fungi including the smuts. Bot. Marina **23**: 361-373.

Moore, R. T. 1990. Patygloeales ord. nov. Mycotaxon **39**: 245-248.

Moore, R. T. 1992. The genus *Bauhinus* gen. nov.: for species of *Ustilago* on dicot hosts. Mycotaxon **45**: 97-100.

Moore, R. T. 1996. An inventory of the phylum Ustomycota. Mycotaxon **59**: 1-31.

Moore, R. T., and McAlear, J. H. 1962. Fine structure of Mycota. 7. Observations on septa of ascomycetes and basidiomycetes. Amer. J. Bot. **49**: 86-94.

Müller, B. 1989. Chemotaxonomische Untersuchungen an Basidiomyceten. Thesis, Lehrstuhl Spezielle Botanik und Mykologie, Universität Tübingen, Tübingen, Germany.

Nagler, A., Bauer, R., Berbee, M., Vánky, K. and Oberwinkler, F. 1989. Light and electron microscopic studies of *Schroeteria delastrina* and *S. poeltii*. Mycologia **81**: 884-895.

Nagler, A., Bauer, R., Oberwinkler, F., and Tschen, J. 1990. Basidial development, spindle pole body, septal pore, and host-parasite-interaction in *Ustilago esculenta*. Nord. J. Bot. **10**: 457-464.

Oberwinkler, F. 1982. The significance of the morphology of the basidium in the phylogeny of basidiomycetes. IN K. Wells & E. K. Wells (eds) Basidium and basidiocarp. Springer Verlag, New York, pp. 9-35.

Oberwinkler, F. 1985. Anmerkungen zur Evolution und Systematik der Basidiomyceten. Bot. Jahrb. Syst. Planzengesch. Pflanzengeogr. 107: 541-580.

Oberwinkler, F., and Bandoni, R. J. 1982a. A taxonomic survey of the gastroid, auricularioid Heterobasidiomycetes. Can. J. Bot. **60**: 1726-1750.

Oberwinkler, F., and Bandoni, R. J. 1982b Atractogloea: a new genus in Hoehnelomycetaceae (Heterobasidiomycetes). Mycologia **74**: 634-639.

Oberwinkler, F., and Bauer, R. 1989. The systematics of gastroid, auricularioid Heterobasidiomycetes. Sydowia **41**: 224-256.

Oberwinkler, F. and Bauer, R. 1990. *Cryptomycocolax*: a new mycoparasitic heterobasidiomycete. Mycologia **82**: 671-692.

Oberwinkler, F., Bandoni, R. J., Blanz, P., Deml, G., and Kisimova-Horovitz, L. 1982. Graphiolales: basidiomycetes parasitic on palms. Pl. Syst. Evol. **140**: 251-277.

Oberwinkler, R., Bauer, R., and Bandoni, R. J. 1990. *Colacogloea*: a new genus in the auricularioid heterobasidiomycetes. Can. J. Bot. **68**: 245-255.

O'Donnell, K. L., and McLaughlin, D. J. 1984. Ultrastructure of meiosis in *Ustilago maydis*. Mycologia **76**: 468-485.

Piepenbring, M., and Bauer, R. 1995. Noteworthy germinations of some Costa Rican Ustilaginales. Mycol. Res. **99**: 853-858.

Prillinger, H., Deml, G., Dörfler, C., Laaser, G., and Lockau, W. 1991. Ein Beitrag zur Systematik und Entwicklungsbiologie höherer Pilze: Hefe-Typen der Basidiomyceten. Teil II. *Microbotryum*-Typ. Bot. Acta **104**: 5-17.

Prillinger, H., Oberwinkler, F., Umile, C., Tlachac, K., Bauer, R., Dörfler, C., and Taufratzhofer, E. 1993. Analysis of cell wall carbohydrates (neutral sugars) from ascomycetous and basidiomycetous yeasts with and without derivatization. J. Gen. Appl. Microbiol. **39**: 1-34.

Rosing, W. C. 1985. Fine structure of cleistothecia, asci, and ascospores of *Myxotrichum deflexum*. Mycologia **77**: 920-925.

Schmitter, A. 1984. Vergleichende Untersuchungen zur Aufklärung von Verwandtschaftsverhältnissen innerhalb der Gattung *Ustilago* (Pers.) Roussel. Thesis, Lehrstuhl Spezielle Botanik und Mykologie, Universität Tübingen, Tübingen, Germany.

Schröter, J. 1877. Bemerkungen und Beobachtungen über einige Ustilagineen. IN F. Cohn (ed.) Beiträge zur Biologie der Pflanzen. Kern's Verlag, Breslau. Bd. 2: 362 ff. + Taf. XII.

Swann, E. C., and Taylor, J. W. 1993. Higher taxa of basidiomycetes: an 18S rRNA gene perspective. Mycologia **85**: 923-936.

Swann, E. C., and Taylor, J. W. 1995. Phylogenetic diversity of yeast-producing basidiomycetes. Mycol. Res. **99**: 1205-1210.

Thirumalachar, M. J., and Whitehead, M. D. 1968. Notes on the smut genera *Entorrhiza* and *Schroeteria*. Amer. J. Bot. **55**: 183-186.

Vánky, K. 1968. Ustilaginale noi pentru microflora Republicii Socialiste Romania. Commun. Bot. **6**: 109-111.

Vánky, K. 1981. The genus *Schroeteria* Winter (Ustilaginales). Sydowia **34**: 157-166.

Vánky, K. 1993. Taxonomical studies on Ustilaginales. X. Mycotaxon **48**: 27-44.

Vánky, K. 1994. European smut fungi. Gustav Fischer Verlag, Stuttgart, Jena, New York.

Vánky, K. 1996. *Mycosyrinx* and other pair-spored Ustilaginales. Mycoscience **37**: 173-185.

Webster, J., and Chien, C. Y. 1990. Ballistospore discharge. Trans. Mycol. Soc. Japan **31**: 301-315.

Webster, J., Davey, T. A., Duller, G. A., and Ingold, C. T. 1984. Ballistospore discharge in *Itersonilia perplexans*. Trans. Br. mycol. Soc. **82**: 13-29.

Wells, K. 1994. Jelly fungi, then and now! Mycologia **86**: 18-48.

Winter, G. 1876. Einige Notizen über die Familie der Ustilagineen. Flora **59**: 145-152, 161-172.

MYCOTAXON

Volume LXIV, pp. 321-333 September 1997

CONTRIBUTIONS TOWARDS A MONOGRAPH OF *PHOMA* (COELOMYCETES)-V. SUBDIVISION OF THE GENUS IN SECTIONS

G.H. BOEREMA

Karel Doormanstraat 4^5, 2041 HD Zandvoort, the Netherlands

Abstract. The differentiating characteristics and nomenclatural history of the nine recognized sections of *Phoma* Sacc. are listed and displayed in a diagram, tables and keys. Four section names have been formally introduced as new taxa: *Macrospora* sect. nov., *Phyllostictoides* (Zherbele) sect. nov., *Pilosa* sect. nov. and sect. *Sclerophomella* (Höhnel) comb. nov.

Comparative study of numerous species of *Phoma* Sacc. in vivo and in vitro has finally led to the differentiation of that coelomycetous genus into nine sections. Some of these are artificial, but others represent natural units (compare Boerema, 1985 and Van der Aa et al., 1990). Despite this heterogeneity members of all sections are united in one common characteristic: that the majority of the hyaline conidia remain one-celled in vitro. Conidial septation appears to be a secondary division process; the wall of the septate conidium is not thicker than that of the aseptate conidium (see Boerema & Bollen, 1975). In all cases the first conidium of a conidiogenous cell arises as a thick-walled papilla; see fig. 1, conidiogenesis in *Phoma herbarum* Westend., the type species of the genus (p. 322).

The characteristics of the most common sections were discussed in Van der Aa et al. (l.c.); four of them, sect. *Phoma* sensu stricto, sect. *Peyronellaea*, sect. *Plenodomus* and sect. *Heterospora* have been the subjects of the previously published 'Contributions towards a monograph of *Phoma*' (de Gruyter & Noordeloos, 1992, Boerema, 1993, de Gruyter, Noordeloos & Boerema, 1993, Boerema, de Gruyter & van Kesteren, 1994, Boerema, Loerakker & Hamers, 1996 and Boerema, de Gruyter & Noordeloos, 1996). The present paper deals with both the universal and differentiating characteristics of all nine sections.

The nomenclator of the genus (p. 323)shows that most sections include some species with a teleomorph in the genus *Didymella* Sacc. ex Sacc. Three sections, however, are characterized by their connection with other teleomorphic genera, viz. *Leptosphaeria* Ces. & de Not., *Mycosphaerella* Johanson and *Pleospora* Rabenh. ex Ces. & de Not. The nomenclator also indicates that unicellular chlamydospores may occur in all sections, whereas multicellular chlamydospores are distinctive for section *Peyronellaea*. The synamorphic genera listed, are facultative and mainly important for identification at species level, but synanamorphs in the genus *Stagonosporopsis* Died. are characteristic for the section *Heterospora*.

The distribution of species within the various sections of *Phoma*, the relationships between the sections and their similarity with some other coelomycetous genera are shown diagramatically in fig. 2 (p. 324).

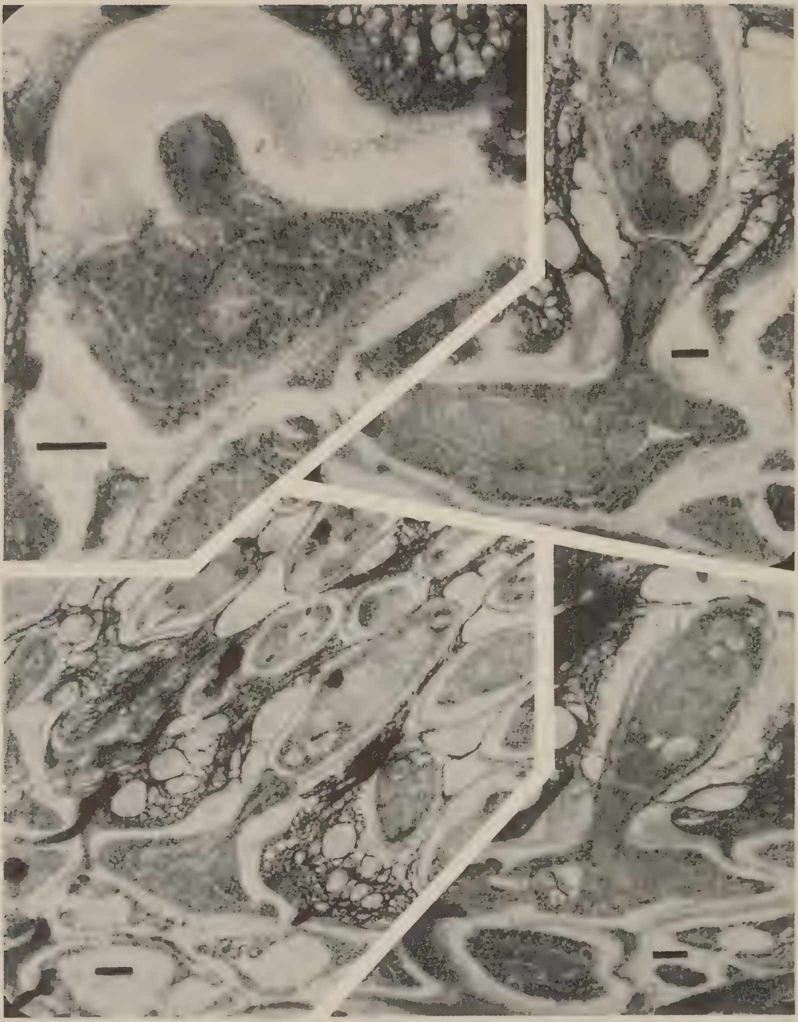


Fig. 1.-- Transmission electron-micrographs of the conidiogenesis in *Phoma herbarum* Westend. Left above the characteristic thick-walled papillate extension initiating the bud-like development of the first conidium. The wall of the first conidium arises within the electron-transparent inner layer of the thickened wall. The more or less electron-dense middle layer seems to function as 'opener' of the conidiogenous locus and finally dissolves into mucilage. The electron-transparent outer layer of the papilla also dissolves in the process of conidial development and secession to a series of mucilaginous drops. In secession three layers are involved: the basal conidial wall, the separation plate and the wall of the next conidial initial. In the collarette the three layers of the original papilla can still be distinguished. Bar 0.5 µm. Electron microscopy done at the Technical and Physical Engineering Research Service at Wageningen, 1972 (for methods see Boerema and Bollen, 1975).

NOMENCLATOR OF *PHOMA* Sacc. emend. Boerema & Bollen

Phoma Saccardo, Michelia **2**(1) (1880)
4 [as 'Fr. em.'; nomen genericum conservandum, 8th Inter. Bot. Congr., Paris 1954]. emend. Boerema & Bollen, Persoonia **8**(2) (1975) 134-136.
sect. *Phoma* (Pho)

[sect. *Heterospora* (Het)

= *Paraphoma* Morgan-Jones & White, Mycotaxon **18**(1) (1983) 59-60.
sect. *Paraphoma* (Par)

= *Peyronellaea* Goidanich, Atti Accad. naz. Lincei Rc. VIII, **1** (1946) 455 [without Latin description] ex Togliani, Annali Sper. agr. II, **6** (1952) 93.
sect. *Peyronellaea* (Pey)

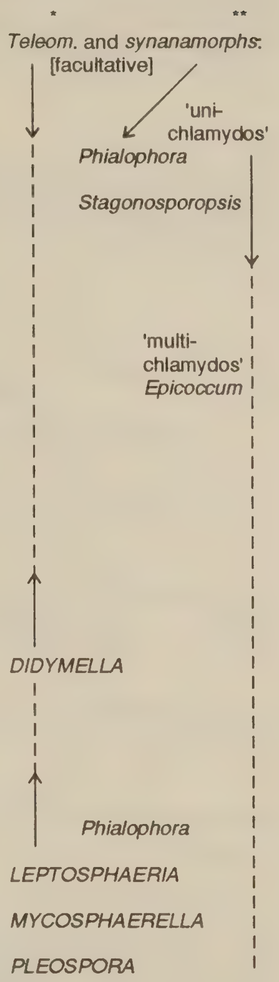
= *Ascochyta* Lib. sect. *Phyllostictoides* Zherbele, Trudy vses. Inst. Zashch. Rast. **29** (1971) 20.
Polyopeus Horne, J. Bot., Lond. **58** (1920) 239.
sect. *Phyllostictoides* (Phy)

= *Sclerophomella* Höhnel, Hedwigia **59** (1917) 237.
Sclerochaetella Höhnel, Hedwigia **59** (1918) 251-252.
sect. *Sclerophomella* (Scl)

= *Plenodomus* Preuss, Linnaea **24** (1851) 145.
Diploplenodomus Diedicke, Annls mycol. **10** (1912) 140.
Leptophoma Höhnel, Sber. Akad. Wiss. Wien [Math.-naturw. Kl. Abt. I] **124** (1915) 73.
Deuterophoma Petri, Boll. R. Staz. Pat. veg. Roma II, **9**(4) (1929) 396.
sect. *Plenodomus* (Ple)

[sect. *Macrospora* (Mac)

[sect. *Pilosa* (Pil)


*
**
Teleom. and *synanamorphs*:
[facultative]
'uni-chlamydos'
Phialophora
Stagonosporopsis
'multi-chlamydos'
Epicoccum
DIDYMELLA
Phialophora
LEPTOSPHAERIA
MYCOSPHAERELLA
PLEOSPORA

Lectotype species (8th Intern. Bot. Congr., Paris, 1954): *Phoma herbarum* Westendorp, Bull. Acad. r. Belg. Cl. Sci. **19**(3) (1852) 118; lectotype [Boerema, Persoonia **3**(1) (1964) 10, Pl. 1 figs 1,2.] in herbarium Westendorp & Wallays (BR): exs. Herb. crypt. Belg., Ed. Beyaerts-Feys, Fasc. 20 (1854) No. 965, on stems of *Onobrychis viciifolia*.

*

Teleomorphs
Didymella Saccardo ex Saccardo, Michelia **2**(1) (1880) 57.

Leptosphaeria Cesati & de Notaris, Comment. Soc. crittogam. ital. **1**(4) [= Schema Sfer.] (1863) 234.
Mycosphaerella Johanson, Öfvers K. VetenskAkad. Förh. **41**(9) (1884) 163.
Pleospora Rabenhorst ex Cesati & de Notaris, Comment. Soc. crittogam. ital. **1**(4) [= Schema Sfer.] (1863) 217.

**

Synanamorphs
[uni- and multicellular chlamydospores; nameless]
species of *Epicoccum* Link, Mag. Ges. naturf. Freunde, Berl. **7** (1816) 32.
species of *Phialophora* Medlar, Mycologia **7** (1915) 202.
species of *Stagonosporopsis* Diedicke, Annls mycol. **10** (1912) 142.

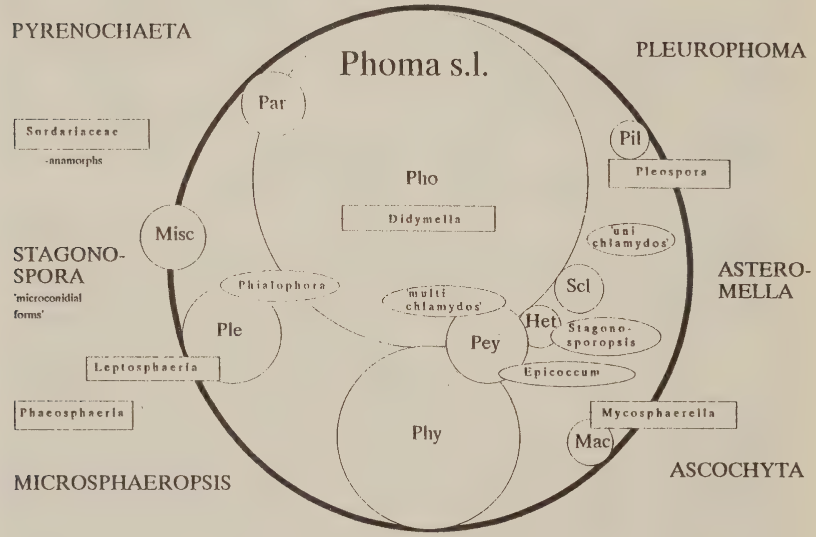

PYRENOCHAETA
Phoma s.l.
PLEUROPHOMA
Par
Sordariaceae
-anamorphs
Pil
Pleospora
Pho
Didymella
Misc
'uni chlamydos'
STAGONO-SPORA
'microconidial forms'
ASTERO-MELLA
Phialophora
'multi chlamydos'
Scl
Het
Stagono-sporopsis
Ple
Pey
Leptosphaeria
Epicoccum
Phaeosphaeria
Mycosphaerella
Phy
Mac
MICROSPHAEROPSIS
ASCOCHYTA

Fig. 2.-- Diagrammatic representation of the different sections presently distinguished within the genus *Phoma* s.l.:○, with indication of connected teleomorphs:☐, synanamorphs: ⬭ , and 'adjacent' or 'convergent' genera (see p. ...). The diameter of the circles reflects the relative species numbers; arrangement, touching and overlap of the circles indicates resemblance. (For abbreviations of the section-names see the nomenclator, p. 323).

UNIVERSAL AND DIFFERENTIAL CHARACTERISTICS OF THE *PHOMA* SECTIONS IN VIVO

PYCNIDIA with discrete, usually ampulliform-doliiform phialidic conidiogenous cells

- mostly glabrous,
  - but sometimes distinctly hairy (sect. *Pilosa*)
  - or setose (sect. *Paraphoma*)
- mostly thin-walled with pseudo-parenchymatous wall structure
  - but occasionally distinctly thick-walled (sect. *Sclerophomella*)
  - sometimes scleroplectenchymatous (sect. *Plenodomus*)

CONIDIA hyaline or subhyaline

- mostly relatively small (between 2-13 x 0.5-4 µm)
  - all aseptate (universal in sect. *Phoma*; also characteristic for sect. *Paraphoma* and sect. *Pilosa*).
  - or partly 1-2(-3)–septate by secondary septation (universal in sect. *Phyllostictoides*; but also in sect. *Peyronellaea*, sect. *Sclerophomella* and sect. *Plenodomus*).
- sometimes (also) distinctly large (between 8-30 x 2.5-8 µm) aseptate or septate (universal in sect. *Macrospora*; characteristic of conidial dimorph in sect. *Heterospora*, when dominant, classified in the synanamorph genus *Stagonosporopsis*; sometimes also in sect. *Sclerophomella* and sect. *Plenodomus*).

[The percentage of septate conidia in both size-categories may vary between 0-95%; in vitro the majority of the conidia always remains aseptate.]

'ADJACENT' OR 'CONVERGENT' GENERA

Various coelomycetous genera are similar to *Phoma*, but not necessarily related due to evolutionary convergence.

The sections *Phoma* and *Paraphoma* (setose pycnidia), both including species with only aseptate conidia, closely resemble pycnidial genera with aseptate conidia borne on septate conidiophores, such as *Pleurophoma* Höhnel, *Asteromella* Pass. & Thümen (with very small conidia) and *Pyrenochaeta* de Not. (setose pycnidia), compare Sutton (1980).

Old pycnidia of species of the sect. *Peyronellaea* (species with multicellular chlamydospores) often contain relatively dark conidia. Such specimens are sometimes considered to be phaeosporous *Coniothyrium* Auct. = *Microsphaeropsis* Höhnel (Sutton, 1980). On the other hand pycnidia of *Microsphaeropsis* with immature colourless conidia have often been mistaken for a *Phoma*.

Secondary conidial septation is universal in the section *Phyllostictoides*, but also occurs in other sections especially in the large sized conidial dimorph in sect. *Heterospora* (synanam. *Stagonosporopsis*). Many species in these sections were originally described as *Ascochyta*. However, in true species of *Ascochyta* Lib.

the conidia arise as thin-walled protrusions. Just before or after secession these become thick-walled by a new inner wall layer, which by invagination concurrently divides the conidia into two or more cells: 'wall-thickening-septation', see Boerema (1984). True *Ascochyta* spp. therefore can be distinguished from *Phoma* spp. with secondary conidial septation by their mature conidia being nearly always septate, both in vivo and in vitro.

Conidial dimorphism, distinctive for sect. *Heterospora*, is also found in pycnidial anamorphs of some species of *Leptosphaeria* Ces. & de Not. and *Phaeosphaeria* Miyake. However, in that case the large multiseptate conidial phenotypes, classified in *Stagonospora* (Sacc.) Sacc. emend. Leuchtmann, dominate both in vivo and in vitro and the '*Phoma* or *Aposphaeria*-like microconidial forms' are mostly unnamed, compare the Addendum in Contribution III-1 (Boerema, de Gruyter & van Kesteren, 1994). They may be classed in the 'Group Miscellanea', i.e. species which are not covered by the nine presently distinguished sections of *Phoma*. Also in that group may be included the *Phoma*-like anamorphs of some members of the Sporormiaceae, especially species of *Sporormia, Preussia* and *Westerdykiella*.

Finally it should be noted that nearly all sections of *Phoma* include species formerly identified as *Phyllosticta*. True species of *Phyllosticta* Pers. are quite different from *Phoma* spp. and readily distinguished by their relatively large conidia with an apical appendage, see Van der Aa, 1973.

ENTRIES TO THE SECTIONS (ESP. IN VITRO)

Table on the collective and differential features of the sections
+ = characteristic for all or most species. ✚ = principal determining character.
(+) = occurring in some species or only occasionally found.
[for abbreviations of section names see the nomenclator, p. 323]

Features of:	Pho	Het	Par	Pey	Phy	Scl	Ple	Mac	Pil
pycnidia									
- glabrous	+	+		+	+	+	+	+	
- pilose	(+)		(+)	(+)	(+)		(+)		✚
- setose			✚				(+)		
- thin-walled	+	+	+	+	+		+	+	+
- thick-walled				(+)		✚	✚		
- pseudoparenchymatous	+	+	+	+	+	+	(+)	+	+
- scleroplectenchymatous							✚		
- conspicuous ostiole	+	+	+	+	+			+	
- inconspicuous ostiole	(+)	(+)			(+)				+
- with pore or ruptured (second. opening)				(+)		✚	✚		+
hyphae									
- with phialoconidia	(+)						(+)		
- with dark unicellular chlamydospores	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
- with dark multicellular chlamydospores		(+)		✚					
conidia									
- of 'normal size' [(2-)3-11(-13) x (0.5-)1.5-4(-5) µm]	✚	+	+	+	+	+	+		+
- (partly or all distinctly large [(8-)11-25(-30->) x (2.5-)3-6(-8->) µm]		(✚)			(+)	(+)	(+)	✚	
- aseptate	✚	+	+	+	+	+	+	+	+
- also secondarily septate		(+)		(+)	✚	(+)	(+)	(+)	
Teleomorph:									
Didymella	(+)	(+)			(+)	(+)			
Pleospora									✚
Leptosphaeria							(+)		
Mycosphaerella								(+)	
	Pho	Het	Par	Pey	Phy	Scl	Ple	Mac	Pil

Dichotomous key to the sections based on characteristics in vitro

1 a. Fresh *Phoma*-isolates readily develop pycnidia in vitro **2**
b. Isolates do not readily develop pycnidia in vitro; conidia may be produced directly from the mycelium; sometimes only multicellular chlamydospores develop **11**

2 a. Colonies produce typical multicellular chlamydospore type structures, unicellular chlamydospores may also be present **11a**
b. Colonies lacking multicellular chlamydospore type structures, but unicellular chlamydospores may be present **3**

3 a. Pycnidia scleroplectenchymatous **15b**
b. Pycnidia pseudoparenchymatous **4**

4 a. Pycnidia thin-walled **5**
b. Pycnidia rather thick-walled **14**

5 a. Pycnidia with predetermined ostiole (iniated in primordium) **6**
b. Pycnidia at first closed, then opened by a secondary pore; often thin-walled cellular protrusions in pycnidial cavity **15a**

6 a. Pycnidia glabrous, but often with some hyphal outgrowths (semi-pilose) **7**
b. Pycnidia distinctly pilose (hairy by many protruding hyphae) or setose (with straight or slightly flexuous setae) **10**

7 a. Conidia all relatively small, (2-)3-11(-14) x (0.5-)1-4(-5) µm, aseptate or secondarily septate **8**
b. Conidia all, or partly, distinctly large, (7-)11-25(-30 or longer) x (2.5-)3-6(-8 or wider) µm, aseptate or septate **9**

8 a. Conidia all aseptate [also in vivo, but germination may be associated with secondary septation], mostly 3-11 x 1.5-4 µm. In a single species conidia are produced directly from the mycelium (*Phialophora* synanamorph)
1. sect. *Phoma*
NB. If septate conidia occur in vivo, a species of sect. *Heterospora* (this key no. 9a), or sect. *Phyllostictoides* (this key no. 13a) may be involved.

b. Some conidia 1–septate (occasionally 2--septate) [septation often more prominent and sometimes even dominant in vivo] **13**

9 a. Usually only a few extremely large conidia occur; often becoming 1–septate, but in some species remaining aseptate. Most conidia small and aseptate [In vivo and also occasionally in fresh cultures a high percentage of the conidia may become large and 1–septate or even 2-3–septate (*Stagonosporopsis* synanamorphs)].
2. sect. *Heterospora*
NB. Distinctly large septate conidia also occur in some species of sect. *Sclerophomella* (this key no. 14a), and occasionally also in species of sect.

Phyllostictoides (this key no. 13a).

b. Always many large conidia, aseptate or 1–septate **16**

10 a. Pycnidia setose with distinct ostiole; the well differentiated thick-walled setae may be scattered over entire surface or concentrated around the ostiole.
3. sect. *Paraphoma*
NB. Setose pycnidia also occur in some species of sect. *Plenodomus* (this key no. 15b).

b. Pycnidia pilose (hairy) with inconspicuous ostiole **17**

11 a. Production of multicellular chlamydospores, mostly alternarioid to irregular-botryoid, sometimes epicoccoid (*Epicoccum* synanamorph) or resembling pseudosclerotia; often unicellular chlamydospores also occur. Conidia mostly aseptate, but occasionally longer ones become 1–septate.
4. sect. *Peyronellaea*
NB. Species with multicellular chlamydospores also occur in sect. *Heterospora* (this key no. 9a).

b. Production of conidia directly from the mycelium: *Phialophora* synanamorph **12**

12 a. Pycnidial-type in vivo (source of isolate) scleroplectenchymatous ('*Plenodomus*-like') **15b**
b. Pycnidial-type in vivo (source of isolate) pseudoparenchymatous ('*Phoma*-like') **8**

13 a. The 1–septate conidia only a little larger than the aseptate conidia. Majority of the conidia always aseptate [In vivo a high percentage of the conidia may become 1(-2)–septate (5 to 95%)].
5. sect. *Phyllostictoides*
NB. Species with septate conidia also occur in sect. *Peyronellaea* (this key no. 11a) and sect. *Plenodomus* (this key no. 15b).

b. The 1--septate conidia sometimes extremely large **9a**

14 a. Pycnidia initially closed, thick-walled with pseudoparenchymatous wall structure. Conidia mostly aseptate, but some 1(-2)–septate conidia usually occur. These may be normal in size and also extremely large [in vivo a high percentage of both sizes may be septate, ascochytoid].
6. sect. *Sclerophomella*
b. Pycnidia and epicoccoid multichlamydospores occur (Epicoccoid synanamorph) **11a**

15 a. Pycnidia poroid, thin-walled and pseudoparenchymatous, often with series of cells protruding into the pycnidial cavity [in vivo these pseudoparenchymatous

pycnidia (Type I) may become scleroplectenchymatous (Type II)] **15b**

b. Pycnidia poroid, thick-walled and scleroplectenchymatous [Type II], cavity often irregular by invaginations from the wall; sometimes only pycnosclerotia [III]. All species make scleroplectenchyma but some species produce only thin-walled pseudoparenchymatous pycnidia in vitro [Type I, this key no. 15a]. One species usually only produces conidia directly from the mycelium in vitro (*Phialophora* synanamorph). Conidia mostly aseptate, but some of the longer ones may become 1–septate [in vivo such species may produce a high percentage of 1–septate conidia].

7. sect. *Plenodomus*

16 a. Conidia for the most part large, aseptate or secondarily septate [in vivo conidia are also large, aseptate or septate].

8. sect. *Macrospora*

[b. Many large conidia also occur occasionally in fresh cultures of species belonging to sect. *Heterospora*; this Key 9a]

17 a. Mature pycnidia distinctly pilose (hairy by a great number of protruding hyphae) with inconspicuous ostiole. Conidia always aseptate [in vivo conidia are also always aseptate]

9. sect. *Pilosa*

[b. Semi-pilose pycnidia - i.e. with some hyphal outgrowths, especially near the opening - may occur in most other sections]

DIAGNOSTIC SYNOPSES OF THE SECTIONS
(primarily concerning characters in vitro)

1. *Phoma* Sacc. sect. *Phoma*
Automatically established in 1981 with the differentiation of *Phoma* sect. *Plenodomus* Boerema et al., see below.

Type: *Phoma herbarum* Westendorp, see the documentation in the nomenclator of the genus (p. ...).

- Pycnidia thin-walled, pseudoparenchymatous, distinctly ostiolate and glabrous, but sometimes with hyphal outgrowths (semi-pilose).
- Conidia always aseptate, in vitro as well as in vivo. A few species produce significantly larger conidia in vivo than in vitro. Conidia production occurring freely on hyphae (*Phialophora* synanamorph) and fragmentation of hyphae (arthrospores) is occasionally observed in vitro.
- Chlamydospores, if present, unicellular.
- Teleomorph, if known, *Didymella*.

2. *Phoma* sect. *Heterospora* Boerema et al.
Phoma sect. *Heterospora* Boerema, de Gruyter & Noordeloos (1996)

Type *Phoma variospora* v.d. Aa & v. Kest. ≡ *Phoma heteromorphospora* v.d. Aa & v. Kest., Persoonia **10**(4) (1980) 542.

- Pycnidia thin-walled, pseudoparenchymatous and ostiolate, glabrous.
- Conidia mainly aseptate in vitro, but usually with some distinctly large, aseptate or secondarily septate conidia; in vivo a high percentage may be extremely large and 1– or more septate: *Stagonosporopsis* synanamorphs.
- Chlamydospores mostly absent; but unicellular if present.
- Teleomorph unknown.

3. *Phoma* sect. *Paraphoma* (Morgan-Jones & White) Boerema
Phoma sect. *Paraphoma* (Morgan-Jones & White) Boerema in Van der Aa, Noordeloos & de Gruyter, Stud. Mycol. **32** (1990) 7.
≡ *Paraphoma* Morgan-Jones & White, Mycotaxon **18** (1983) 58.

Type: *Paraphoma radicis* (McAlp.) Morgan-Jones & White ≡ *Phoma radicina* (McAlp.) Boerema, Versl. Meded. plziektenk. Dienst Wageningen **153** (Jaarb. 1978) (1979) 20.

- Pycnidia with well differentiated thick-walled setae (setose), thin-walled, pseudoparenchymatous and ostiolate (the setae may be scattered over entire surface or concentrated around the ostiole).
- Conidia aseptate, in vitro and in vivo.
- Chlamydospores, if present, unicellular.
- Teleomorph unknown.

4. *Phoma* sect. *Peyronellaea* (Goid. ex Togl.) Boerema
Phoma sect. *Peyronellaea* (Goid. ex Togl.) Boerema in Van der Aa, Noordeloos & de Gruyter, Stud. Mycol. **32** (1990) 6.
≡ *Peyronellaea* Goidanich ex Togliani, Annali Sper. agr. **2**(6) (1952) 93.

Type: *Peyronellaea glomerata* (Corda) Goid. ex Togl. = *Phoma glomerata* (Corda) Wollenw. & Hochapf., Z. ParasitKde **8** (1936) 592.

- Pycnidia usually thin-walled, pseudoparenchymatous, distinctly ostiolate and glabrous, but sometimes with hyphal outgrowths (semi-pilose). One species added to this section produces thick-walled poroid pycnidia [compare sect. *Sclerophomella*].
- Conidia mostly aseptate in vitro, but sometimes some 1--septate conidia may also occur.
- Chlamydospores mainly multicellular: alternarioid, botryoid-alternarioid, pseudosclerotioid or epicoccoid (*Epicoccum* synanamorph), unicellular chlamydospores may also occur [multicellular chlamydospores also occur in two species of sect. *Heterospora*].
- Teleomorph unknown.

5. *Phoma* sect. *Phyllostictoides* Zherbele ex Boerema sect. nov.
≡ *Ascochyta* sect. *Phyllostictoides* Zherbele, Trudy vses. Inst. Zashch. Rast. **29** (1971) 20 = *Phoma* sect. *Phyllostictoides* (Zherbele) Boerema, in Van der Aa, Noordeloos & de Gruyter, Stud. Mycol. **32** (1990) 6 (both nom. invalid. Art. 36). Conidiis in vivo saepe (5-95%) 1(-2)–septatis.

Type: *Ascochyta althaeina* Sacc. & Bizz. = *Phoma exigua* Desm. var. *exigua*, Annls Sci. nat. (Bot.) III, **11** (1849) 282-283 [as 'Var. a'].

- Pycnidia thin-walled, pseudoparenchymatous, distinctly ostiolate or with pore, glabrous, but sometimes with hyphal outgrowths (semi-pilose).
- Conidia mainly aseptate in vitro, but usually with 1-2–septate conidia of normal *Phoma* size; in vivo 5 to 95% of the conidia may be septate.
- Chlamydospores, if present, unicellular.
- Teleomorph, if known, *Didymella*.

6. *Phoma* sect. *Sclerophomella* (Höhnel) comb. nov.
Phoma sect. *Sclerophomella* (Höhnel) Boerema, de Gruyter & Noordeloos comb. nov.
≡ *Sclerophomella* Höhnel, Hedwigia **59** (1917) 237.

Type: *Sclerophomella complanata* (Tode : Fr.) Höhnel ≡ *Phoma complanata* (Tode : Fr.) Desmazières, Annls Sci. nat. (Bot.) III, **16** (1851) 299-300.

- Pycnidia: thick-walled–pseudoparenchymatous, both in vitro and in vivo (no scleroplectenchyma), poroid, glabrous.
- Conidia mostly aseptate in vitro, but sometimes mixed with 1– or more septate conidia, ranging from normal *Phoma* size to extremely large, ascochytoid; in vivo a high percentage may be septate, normal size or ascochytoid.
- Chlamydospores, if present, unicellular.
- Teleomorph, if known, *Didymella*.

7. *Phoma* sect. *Plenodomus* (Preuss) Boerema et al.
Phoma sect. *Plenodomus* (Preuss) Boerema, van Kesteren & Loerakker, Trans. Br. mycol. Soc. **77** (1984) 61.
≡ *Plenodomus* Preuss, Linnaea **24** (1851) 145.

Type: *Plenodomus rabenhorstii* Preuss = *Phoma lingam* (Tode : Fr.) Desmazières, Annls Sci. nat. (Bot.) III, **11** (1849) 281, anamorph of *Leptosphaeria maculans* (Desm.) Ces. & de Not.

- Pycnidia may be of two types: I thin-walled, if present occurring both in vitro and in vivo, II thickened by scleroplectenchyma, always occurring in vivo, but sometimes also in vitro [occasionally remaining sterile, III pycnosclerotia]; pycnidia in both types poroid (sometimes accompanied with the development of a long neck or opened by rupture), mostly glabrous, sometimes with hyphal outgrowths (semi-pilose), occasionally setose. Note: some species produce only thin-walled pycnidia in vitro.
- Conidia mostly aseptate in vitro, but in vivo some may become 1–septate. Conidia produced freely on hyphae (*Phialophora* synanamorph) and fragmentation of hyphae to produce arthrospores may occur.
- Chlamydospores usually absent, but conspicuous in one species.
- Teleomorph: Species on herbaceous plants often *Leptosphaeria*.

8. *Phoma* sect. *Macrospora* sect. nov.
Phoma sect. *Macrospora* Boerema, de Gruyter & Noordeloos, sect. nov. Anamorphoses *Mycosphaerellae* Johanson, in vitro et in vivo conidiis magnis, continuis vel septatis.

Type: *Phyllosticta maydis* Arny & R.R. Nelson ≡ *Phoma zeae-maydis* Punithalingam, Mycopathologia **112** (1990) 50, anamorph of *Mycosphaerella zeae-maydis* Mukunya & Boothroyd.

- Pycnidia thin-walled, pseudoparenchymatous, poroid or ostiolate, glabrous.
- Conidia extremely large, i.e. their length and width exceed the general conidial measurements of the genus, in vitro as well as in vivo initially aseptate, but they may become 1--septate by secondary septation.
- Chlamydospores, if present, unicellular.
- Teleomorph: *Mycosphaerella*.

9. *Phoma* sect. *Pilosa* sect. nov.
Phoma sect. *Pilosa* Boerema, de Gruyter & Noordeloos sect. nov. Anamorphoses *Pleosporae* Rabenh. ex Ces. & De Not., pycnidiis pilosis ostiolatis et conidiis aseptatis.

Type: *Phoma betae* Frank, Z. Rübenzucker-Ind. **42** (1892) 905-906, anamorph of *Pleospora betae* (Berl.) Nevod.

- Pycnidia thin-walled, pseudoparenchymatous with an inconspicuous small ostiole and surrounded by hyphae emerging from them (pilose or hairy; particularly conspicuous in vitro).
- Conidia aseptate in vitro and in vivo.
- Chlamydospores, if present, unicellular.
- Teleomorph: *Pleospora*.

ACKNOWLEDGEMENTS

Thanks are due to Dr R.T.A. Cook for reviewing the manuscript. Dr W. Gams kindly provided the Latin translations of descriptions.

REFERENCES

Aa, H.A. van der, 1973. Studies in *Phyllosticta* I. Studies in Mycology **5**.

Aa, H.A. van der, M.E. Noordeloos & J.de Gruyter, 1990. Species concepts in some larger genera of the Coelomycetes. Studies in Mycology **32**: 3-19.

Boerema, G.H., 1984. Mycologisch-taxonomisch onderzoek. Verslagen en Mededelingen Plantenziektenkundige Dienst Wageningen **162** (Jaarboek 1983): 23-34.

Boerema, G.H., 1985. Mycologisch-taxonomisch onderzoek. Verslagen en Mededelingen Plantenziektenkundige Dienst Wageningen **163** (Jaarboek 1984): 34-40.

Boerema, G.H., 1993. Contributions towards a monograph of *Phoma* (Coelomycetes) II. Section *Peyronellaea*. Persoonia **15**(2): 197-221.

Boerema, G.H. & G.J. Bollen, 1975. Conidiogenesis and conidial septation as differentiating criteria between *Phoma* and *Ascochyta*. Persoonia **8**(2): 111-144.

Boerema, G.H., J. de Gruyter & H.A. van Kesteren, 1994. Contributions towards a monograph of *Phoma* (Coelomycetes) III-1. Section *Plenodomus*: Taxa often with a *Leptosphaeria* teleomorph. Persoonia **15**(4): 431-487.

Boerema, G.H., J. de Gruyter & M.E. Noordeloos, 1997. Contributions towards a monograph of *Phoma* (Coelomycetes) IV. Section *Heterospora*: Taxa with large sized conidial dimorphs, in vivo sometimes as *Stagonosporopsis* synanamorphs. Persoonia **16**(3): 335-371.

Boerema, G.H., W.M. Loerakker & M.E.C. Hamers, 1996. Contributions towards a monograph of *Phoma* (Coelomycetes) III-2. Misapplications of the type species name and the generic synonyms of section *Plenodomus* (Excluded species). Persoonia **16**(2): 141-190.

Gruyter, J. de & M.E. Noordeloos, 1992. Contributions towards a monograph of *Phoma* (Coelomycetes) I-1. Section *Phoma*: Taxa with very small conidia in vitro. Persoonia **15**(1): 71-92.

Gruyter, J. de, M.E. Noordeloos & G.H. Boerema, 1993. Contributions towards a monograph of *Phoma* (Coelomycetes) I-2. Section *Phoma*: Additional taxa with very small conidia and taxa with conidia up to 7 μm long. Persoonia **15**(3): 369-400.

Sutton, B.C., 1980. The Coelomycetes. Fungi imperfecti with pycnidia, acervuli and stromata. CMI Kew.

MYCOTAXON

Volume LXIV, pp. 335-342 September 1997

NOTES ON CONIDIAL FUNGI VI. *MENISPOROPSIS*

R. F. Castañeda Ruiz[1], J. Cano[2] and J. Guarro[2]

[1] Instituto de Investigaciones Fundamentales en Agricultura Tropical "Alejandro Humboldt" (INIFAT) Calle 1 esq. 2 Santiago de las Vegas, Ciudad Habana, Cuba. [2] Unitat de Microbiologia, Facultat de Medicina i Ciències de la Salut, Universitat Rovira i Virgili, 43201 Reus, Tarragona, Spain.

ABSTRACT

Following the isolation of ***Menisporopsis pirozynskii*** in Cuba, a comparative study of the species of ***Menisporopsis*** has been made, and a key to the described species of this genus is provided. The new combination ***Vermiculariopsiella ludoviciana*** is proposed.

Key words: ***Menisporopsis***, systematics, tropical fungi, ***Vermiculariopsiella.***

RESUMEN

A partir de una cepa de ***Menisporopsis pirozynskii*** aislada en Cuba, se ha realizado un estudio comparativo de las especies del género ***Menisporopsis***, se incluye una clave de clasificación de las especies descritas en el mismo. Se propone la nueva combinación ***Vermiculariopsiella ludoviciana***.

Palabras clave: ***Menisporopsis***, sistemática, hongos tropicales, ***Vermiculariopsiella.***

During a mycological trip on the mountains of Santiago de Cuba, numerous microfungi were collected. Among them was a collection presumably belonging to ***Menisporopsis pirozynskii*** Varghese & Rao which was subsequently isolated in pure culture. This species was compared with the other members of the genus and a key to all described species of ***Menisporopsis*** was elaborated.

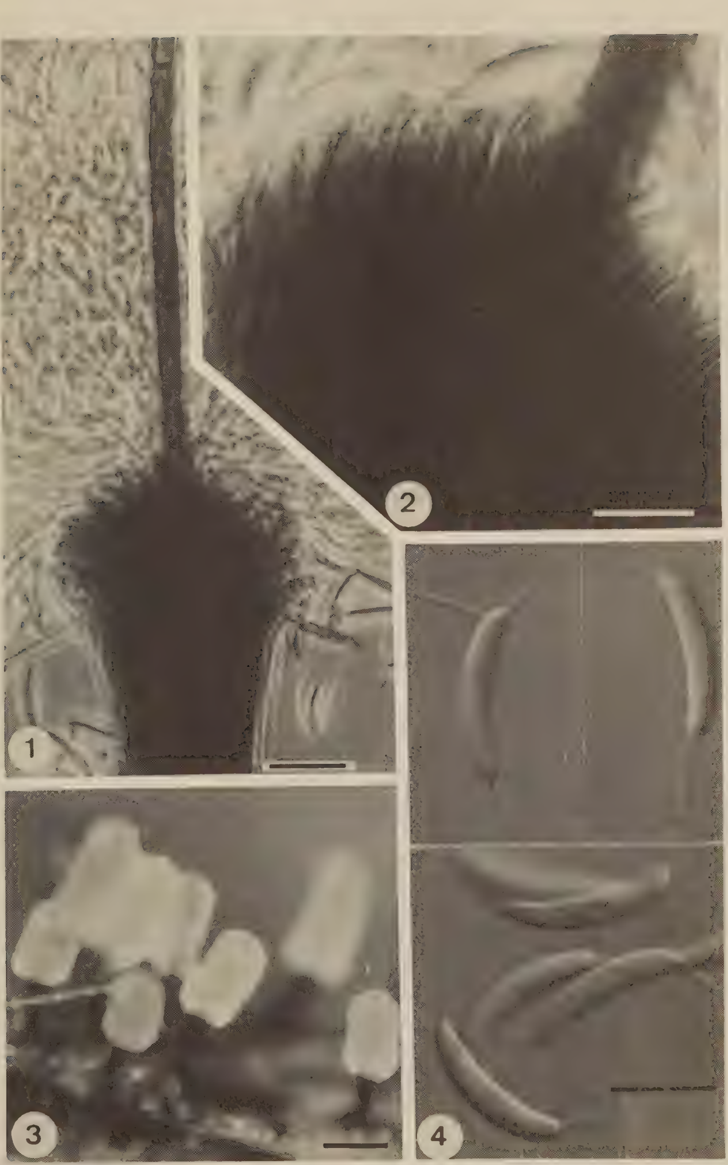
The material were collected in plastic bags, and incubated for seven days in petri dishes containing moistened filter paper. Fungi which developed in these damp chambers were examined under a stereo dissecting microscope and slide mounts of small portions of the fungus were made in water and polyvinyl alcohol. Pure cultures were obtained on oatmeal agar (Difco Co). Cultures were grown for seven days at 25 ° C.

Menisporopsis pirozynskii Varghese & Rao in Bot. Notiser 131: 215 (1978).
Figs 1-6

Description on the natural substrate: Colonies, spreading, blackish. Mycelium superficial and immersed. Hyphae septate, smooth-walled, brown, 1.5 - 2.5 µm diam. Stromata superficial, 80 - 110 µm diam, dark brown, rudimentary, pseudoparenchymatous, of "textura angularis", cells 2.5 - 5 x 2.5 - 4 µm. Conidiomata synnematous, black, erect, scattered, up to 250 µm tall; base 50 - 60 µm thick, black; stipe hyphae numerous, aggregated around the central setae, smooth, brown to dark brown, septate, up to 250 µm long and 3 - 4 µm wide, slightly divergent at the apex. Setae erect, solitary, straigth or flexuous, unbranched, 11 - 17-septate, cylindrical, smooth, dark brown to black at the base, apex obtuse and brown, up to 450 µm tall, 10 - 14 µm thick at the base. Conidiogenous cells monophialidic, 6 - 30 x 3 - 4.5 µm, terminal, integrated, slightly clavate, brown, periclinal thickening 1 µm wide, with a short, inconspicuous collarette, 1 - 1.5 µm long. Conidia fusiform to allantoid, colorless, thin-walled, amerosporous (0-septate), 15 - 20 x 2 - 3 µm, with 2-3 basal appendages varying in length (1-2 shorter appendages 2 - 4 µm long; 1 longer, 7 - 10 µm long); and with 1-apical appendage 7 - 12 µm long and 1-subapical appendage 3.5 - 6 µm; distance between apical and subapical appendages 2 - 3.5 µm. Conidia accumulating in white, slimy masses, 200-430 x 150-220 µm, around the apex of the synnematal conidiomata.

Substrate: On dead, rotten branchlet, Gran Piedra, Santiago de Cuba, Cuba, leg. J. Cano, 2-Nov-1994.
Specimen examined: IMI 366695 (dried material on natural substrate).

Description in culture: Colonies on oatmeal agar after 7 days at 25°C attaining 2 - 2.8 cm diam, floccose, cream to gray colored, margin regular, reverse not pigmented. Hyphae septate, smooth, brown, 1.5 - 3 µm wide. Conidiomata (generally not synnematal). Setae erect, 55 - 80 x 3 - 4.5 µm, cylindrical, obtuse at the apex, 3-5-septate, scattered, smooth, brown, arising from aerial hyphae. Conidiophores mononematous, solitary or fasciculate, 35 - 70 x 3 - 3.5 µm smooth, brown at the base, pale brown at the apex. Conidiogenous cells monophialidic, 6 - 13 x 2 - 2.5 µm, terminal, integrated, pale brown, slightly clavate, usually without apical collarette, thickening usually



FIGS. 1-4. ***Menisporopsis pirozynskii*** (FMR 5231). 1. Conidioma, bar = 20 µm. 2. Coniogenous cells, bar = 10 µm. 3. Conidiomata on the natural substrate, bar = 200 µm. 4. Conidia and conidial appendages, bar = 10 µm.

not visible. Conidia cylindrical to allantoid, 11 - 15 x 2 - 3 µm, colorless, thin-walled, amerosporous (0-septate), smooth; with 2-3 basal appendages varying in lenght (1 longer, 9 - 10 µm long; and 1-2 shorter, 2 - 3 µm long); 1 apical appendage 9 - 11 µm long and 1 subapical appendage 3 - 4 µm long; distance between apical and subapical appendages 3 - 3.5µm long.

Cultures deposited: FMR 5231 (Culture collection, Faculty Medicine, Reus, Spain), CBS 195.95.

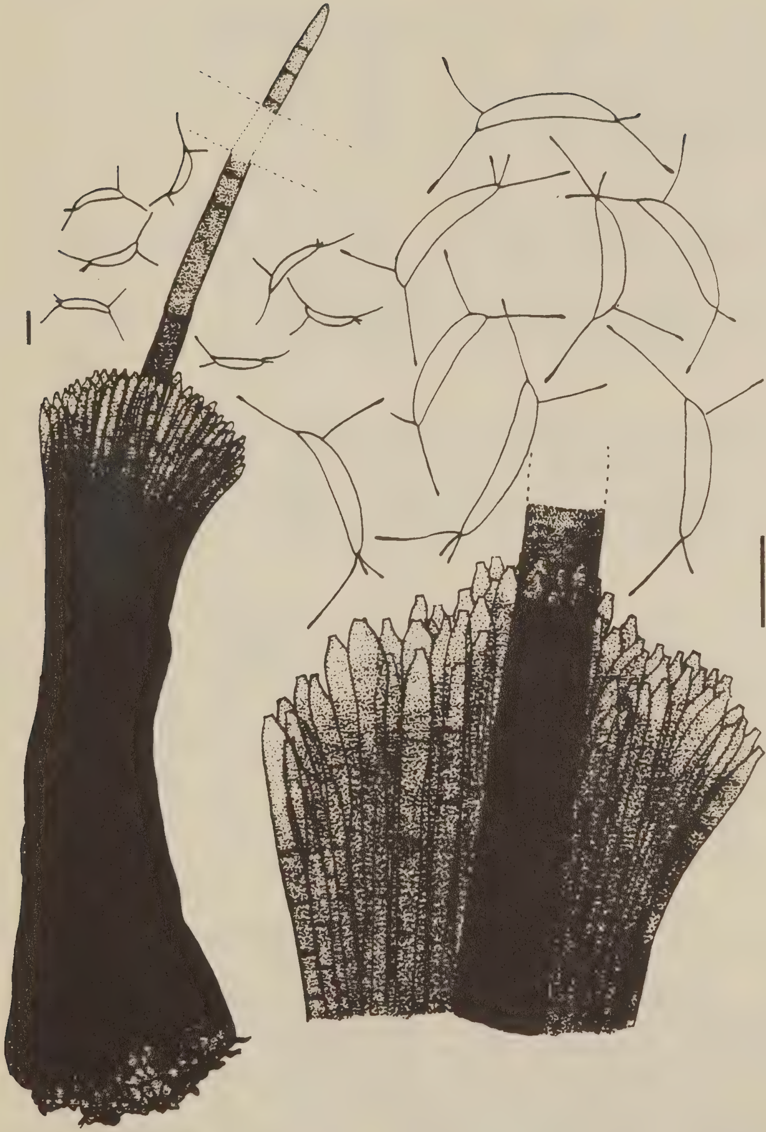
The main characteristics of this isolate are identical with those of the protologue, although some confusions exist in the original description and also in a later description by Cabello et al. (1993). The authors in both papers described the conidiophores as polyphialidic but the illustrations included in the two articles show clearly that they are monophialidic, as is the case in our isolate. Also disagreement concerning the length, position and number of conidial appendages exists between the two above-mentioned articles. We have examined these characters carefully and described them in detail. In fact, the diversity, number, length and arrangement of the conidial appendages provide the conidia of ***M.pirozynskii*** with a unique configuration.

Six species have been described in the genus ***Menisporopsis*** Hughes: the type species ***M. theobromae*** Hughes (Ellis, 1971; Matsushima, 1971); ***M. novae-zelandiae*** Hughes et Kendrick (Hughes and Kendrick, 1968; Matsushima, 1975); ***M. profusa*** Pirozynski et Hodges (1973); ***M. pirozynskii*** Varghese et Rao (1978) and ***M. pleiosetosa*** Rao et de Hoog (1986). In Table 1 the main features of the five species are reported. ***M. ludoviciana*** (Crane et Schoknecht) P.M. Kirk et Sutton (1985), which was proposed on the basis of ***Chaetopsina ludoviciana*** Crane et Schoknecht (1982) is not considered a member of ***Menisporopsis***. From a consideration of its original description and illustration, it appears to be a species of the genus ***Vermiculariopsiella*** Bender, which was recently revised by Nawawi et al. (1990) and the following new combination is proposed:

Vermiculariopsiella ludoviciana (Crane et Schoknecht) Castañeda Ruiz, Guarro et Cano, ***comb. nov.***

Basionym: ***Chaetopsina ludoviciana*** Crane et Schoknecht (1982). Can. J. Bot. 60: 372.

FIGS. 5-6. *Menisporopsis pirozynskii* (FMR 5231). 5. Conidioma, bar = 10 µm. 6. Coniogenous cells and conidia, bar = 10 µm.


5
6

The following key to the five species of **Menisporopsis** is proposed:

KEY TO SPECIES OF *MENISPOROPSIS*

1. Conidiogenous cells polyphialidic.................................. 2

1.'Conidiogenous cells monophialidic..3

2.Conidia 1- septate, 15-18 x 2.4-3.1 µm, with one appendage,
4.3-5.7 µm long, at each end......................................***M. novae-zelandiae***

2'. Conidia 12-15 x 2-2.5 µm, with one appendage,
4.5-6 µm long, at each end...***M. profusa***

3. Conidia 14-20 x 2-3.5 µm, with one appendage,
6-10 µm long, at each end..***M. theobromae***

3.'Conidia whith 2 or more basal appendages and 1-2 apical
appendages 4

4. Conidia ellipsoidal, 12-18 x 4-5 µm, with 2-4 uniform
basal appendages and one apical appendage, all up to
6 µm long...***M. pleiosetosa***

4.'Conidia cylindrical to allantoid, 15-20 x 2-3 µm, with 2-3 basal
appendages of different length (one 7-10 µm
long; one or two shorter, 2.5-4 µm long); one
subapical appendage 3.5- 6 µm long; and one apical
appendage 7-10 µm...***M. pirozynskii***

ACKNOWLEDGMENTS

We thank Prof. G. L. Hennebert (Université Catholique de Louvain, Belgium), Dr. Enrique Descals (Inst. Estudis Avancats de les Balears, CSIC, Spain), Dr. Keith Seifert (Centre for Land and Biological Resources Research, Canada), Dr. B. Kendrick (University of Waterloo, Canada) and Dr. J. Gené (Fac. Medicina, Universitat Rovira i Virgili, Reus, Tarragona, Spain) for reviewing the manuscript and the Cuban Ministry of Agriculture for providing facilities used during this study.

Table 1. Comparative table of the five species of ***Menisporopsis***

Taxa	Setae	Conidiophores	Conidiogenous cells	Collarette	Conidia	Appendages
M. theobromae	Solitary, dark brown, apex brown to pale bown up to 21-septate 200-400 x 4.5-7 µm.	Up to 120 µm long; 2.5-3 µm wide.	Monophialidic, 14-17 x 2-3.5 µm	Conspicuous, infundibuliform, 2-3 µm wide, 1.5-2µm deep.	Cylindrical, colorless, non-septate, 14-18 x 2-3 µm	One at each end, 5-10 µm long.
M.novae-zelandiae	Solitary, dark brown, apex pale brown to subhyaline, 17-septate, 220-820 x 7-11 µm.	42-80 µm long, 1.5-2.1 µm wide.	Monophialidic becoming polyphialidic, 14-23 x 2.8-4.3 µm	Conspicuous, infundibuliform to cupulate 2.1-3.2 µm wide, 1.4-3.6 µm deep.	Allantoid, colorless, 1-septate, 15-18 x 2.4-3.1 µm.	One at each end, 4.3-5.7 µm long.
M. profusa	Solitary, dark brown, apex pale yellow-brown to almost colorless, 10-15- septate, 150-250 x 4.5-6 µm.	60-110 µm long, 2.5-3 µm wide.	Polyphialidic, 20-30 x 2.5-3.5 µm	Conspicuous, cupulate, 3 µm wide, 1.5 µm deep.	Cylindrical, curved, non-septate, 12-15 x 2-2.5µm.	One at each end, 4.5-6 µm long.
M. pleiosetosa	Solitary, dark reddish brown, 10-15-septate, 100-300 x 3-4 µm.	Up to 250 µm tall, 30-40 µm wide.	Monophialidic, 8-24 x 3-5 µm.	Inconspicuous, 1-2 µm wide.	Ellipsoidal, non-septate, 12-18 x 4-5 µm.	1 apical appendage, 2-4 basal appendages (all similar), up to 6 µm long.
M. pirozynskii	Solitary, dark brown to black, apex brown, 11-17- septate, up to 450 µm tall, 10-14 µm wide	Up to 250 µm long, 3-4 µm wide.	Monophialidic, 6-30 x 3-4.5 µm.	Conspicuous cupulate to inconspicuous, 1-1.5 mm wide.	Cylindrical to allantoid, 15-20 x 2-3 µm, non-septate.	1 apical appendage 7-10 µm long , 1 sub apical appendage 3.5-6 µm, 2-3 basal appendages (one 7-10 µm long and 1-2 which are 2-4 µm long)

LITERATURE CITED

Crane, J. L., and J. D. Schoknecht. 1982. Hyphomycetes from freshwater swamps and hammocks. ***Canad. J. Bot.*** 60: 369-378.

Ellis, M. B. 1971. Dematiaceous Hyphomycetes. Commonwealth Mycological Institute, Kew, England, 608 pp.

Hughes, S. J.,and W. B. Kendrick. 1968. ***Menispora, Codinaea, Menisporopsis. New Zeal. J. Bot.*** 6: 323- 375.

Kirk, P. M.,and B. C. Sutton. 1985. Areassessment of the anamorph genus ***Chaetopsina*** (Hyphomycetes). ***Trans. Brit. Mycol. Soc.*** 85: 709-717.

Matsushima, T. 1971. Microfungi of the Solomon Islands and Papua **New Guinea.** T. Matsushima, Kobe, Japan. 78 pp.

___________. 1975. Icones microfungorum a Matsushima lectorum.T. Matsushima, Kobe, Japan. 209 pp.

Nawawi, A., A. J. Kuthubutheen, and B. C. Sutton. 1990. New species and combinations in ***Vermiculariopsiella*** (Hyphomycetes). ***Mycotaxon***. 37: 173-182.

Pirozynski, K. A., and C. S. Hodges. 1973. New Hyphomycetes from South Carolina. ***Canad. J. Bot.*** 51:157- 173.

Rao, V., and G.S. De Hoog. 1986. New or critical hyphomycetes from India.***Stud. Mycol.*** 28: 61-62.

Varghese, K. I. M., and V. G. Rao. 1978. Two new setose hyphomycetes from India. ***Bot. Not.*** 131: 215-217.

MYCOTAXON

Volume LXIV, pp. 343-348 September 1997

A NEW SPECIES AND A SYNONYMY IN *ECHINOSTELIUM* (MYXOMYCETES)

FRANCISCO PANDO

Real Jardín Botánico (CSIC), Plaza de Murillo, 2. 28014 Madrid. Spain

Summary

Echinostelium ladoi sp. nov. is described from Spain. It is characterized by spores and spore-like bodies with articular surfaces that when viewed by transmitted light appear as crescent pairs adjoined at the tips. Similarities and differences of *E. vanderpoelii* Nann. -Bremek. et al. with *E. apitectum* Whitney are discussed and it is concluded that *E. vanderpoelii* must be considered a synonym of *E. apitectum.*

Echinostelium ladoi Pando, **sp. nov.**

Sporocarpia solitaria vel in greges sparsos disposita, 155-240 µm alta, stipitata. Sporotheca globosa, 35-40 µm diam. *Hypothallus* inconspicuus. Stipes 120-200 µm longus, basi 13-20 µm diam., apice 1-2 µm diam., sensim attenuatus, leviter flexuosus, translucidus, sub microscopio hyalinus aut foede luteus, inferne (1/2-2/3 vel amplius) granulis impletus. *Peridium* fugax. *Capillitium* deficiens. *Columella* quoque nulla. *Sporae* liberae, globosae, 6.5-8.5 µm diam. , modice atque disperse rugulosae, cniumctae albae, sub microscopio hyalinae, areolis articularibus parietis -ubi sporae sese tangunt-incrassatis, prominentibus atque perspicue marginatis, lunulas duas cornibus oppositas referentibus. Corpus sporiforme praesens. Plasmodium ignotum.

Sporocarps, isolated or scattered, 155-240 µm high, stalked, when fresh, white (263. White); *sporotheca* globose, 35-40 µm in diam. *Hypothallus* inconspicuous. *Stalk* 120-200 µm long, 1-2 µm diam. at the apex, (5-) 13-20 µm diam. at the base, arising from a non expanded base, slightly flexousus, tapering to the apex, translucent, by transmitted light, hyaline in the upper section, moderate yellow (87. m. Y) where the granular material is, filled with granular material up to 1/2-2/3. *Peridium* completely fugaceous, although an inconspicuous collar might exist. *Capillitium* absent. *Columella* absent. *Spores* free, in mass, white (263. White), by transmitted light, hyaline, globose, 6.5-8.5 µm in diam., minutely and scattered roughened; *spore wall* bearing spore-to-spore thickened articular areas. Articular surfaces as two crescents adjoined, prominent, with sharply truncate margins; *spore-like body* present, slightly larger than the spores, 8-9 µm in diam.

Collections examined:

SPAIN. MADRID: Torrelaguna, 30TVL5421, 900 m.s.m., on bark of living *Juniperus oxycedrus* in moist chamber, C. Lado & F. Pando, 10-XI-1987, 561 Pando, MA-Fungi 22546.

MURCIA: Portman, Peña del Águila, 30SXG9064, 300 m.s.m. , on bark of living *Tetraclinis articulata* in moist chamber, M. Dueñas, C. Lado, F. Pando, V. Rico & M. T. Tellería, 2-III-1988, 606 Pando, MA-Fungi 22586; ibidem, 3-III-1988, 613 Pando, MA-Fungi 22593 [HOLOTYPUS]; ibidem, 4-III-1988, 601-1 Pando, MA-Fungi 22581; ibidem, 9-III-1988, 608 Pando, MA-Fungi 22588; idem, 614-1 Pando, MA-Fungi 22594; ibidem, 11-III-1988, 603 Pando, MA-Fungi 22583; idem, 614-2 Pando, MA-Fungi 22594; ibidem, 17-III-1988, 615 Pando, MA-Fungi 22595.

TURKEY. DELNIZLI: Tekke Köy, ca. 5 Km S of Denizli, 500 m.s.m., stem of *Pinus brutia* in moist chamber, 28-XII-1981. Marja Härkönen 3042.

Type Locality: Spain, Murcia: Portman, Peña del Águila, 30SXG9064, 300 m.s.m.

Type: 613 Pando, MA-Fungi 22593 (Holotype) , on bark of *Tetraclinis articulata* in moist chamber, 3-III-1988.

Habitat: Bark of living trees (*Juniperus oxicedrus, Pinus brutia, Tetraclinis articulata).*

Distribution: Central and Eastern Iberian Peninsula

Etymology: In honor to Dr. C. Lado Rodríguez, from who taught me all I may know about Myxomycetes.

This species is similar in size to *Echinostelium apitectum* K. D. Whitney, *E. brooksii* K. D. Whitney and, *E. paucifilum* K. D. Whitney, and has spore-like bodies on top of stalks as *E. apitectum, E. E. coelocephalum* T. E. Brooks & H. W. Keller and *E. colliculosum* K. D. Whitney & H. W. Keller. However, *E. ladoi* is easily recognized by its spore articular surfaces, which are shaped as two crescents adjoined at the tips. This characteristic sets *E. ladoi* apart from other spore-like body bearing species, which show circular articular surfaces (cf. WHITNEY, 1980) .

The Turkish specimen was published as *Echinostelium sp.* by HÄRKÖNEN & UOTILA (1983). It shows the characteristic crescent-shaped articular surfaces and fits the description of the Iberian specimens thoroughly. This finding enlarges considerably the known range of the species as well as suggesting a Mediterranean inclination in this species.

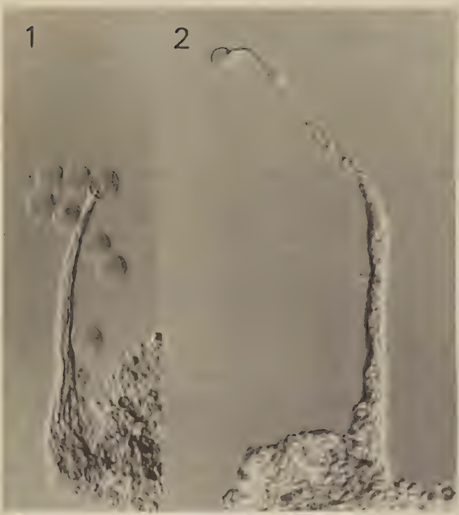
In the descriptions, ISCC-NBS Color Name Charts (Anonymous, 1976) is used for color codes. Following FONT QUER (1953) and DÖRFELT & MARX (1991), we use sporocarp for fruiting body, and we coined sporotheca (from Greek σποροζ=seed and θηχη=box) to refer to the spore containing part of the sporocarp, called by some authors the "proper sporangium."

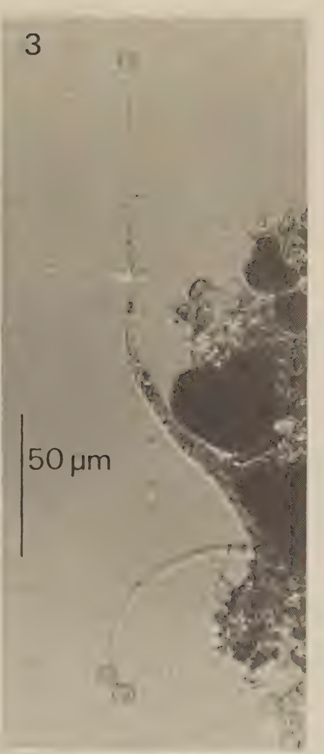
Echinostelium vanderpoelii as a synonym of E. apitectum

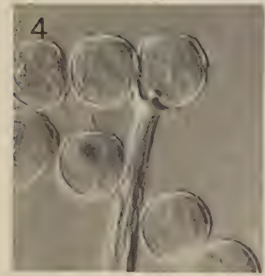
When the original descriptions of *Echinostelium vanderpoelii* and *E. apitectum* are compared, they overlap character by character. They only differ on were the emphasis is placed. The most conspicuous differences found between the two original descriptions are summarized in table 1.

Figs. 1, 2, 4-6, 8– *E. apitectum.* 1. Sporocarp (469 Lado, MA-Fungi 16888). 2. Sporocarp (651 Pando, MA-Fungi 22631). 4. spores and spore-like body (469 Lado, MA-Fungi 16888). 5. Spore-like body (651 Pando, MA-Fungi 22631). 6. Spore-like body with rudimentary capillitium (659 Pando, MA-Fungi 22639)8. Spores (651 Pando, MA-Fungi 22631).

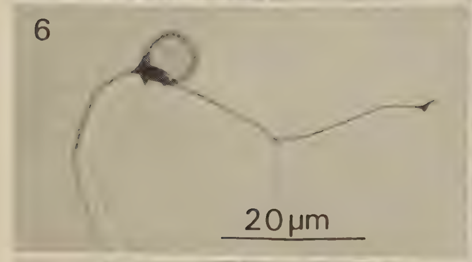
Figs. 3, 7– *E. ladoi.* (613-1 Pando, MA-Fungi 22593). 3. Sporocarps. 7. Spores.
–For comparison, figs. 1-3 are at the same scale, as well as figs. 4-8. –


1
2

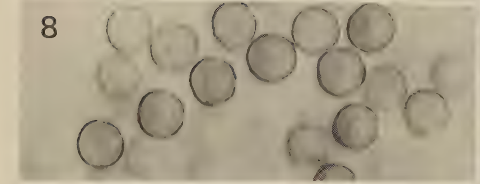

3
50 µm


4

5


6
20 µm

7


8

	Echinostelium apitectum (Whitney, 1980: 954)	*Echinostelium vanderpoelii* (Nannenga-Bremekamp, 1991: 412)
spore diam.	10-12 µm	(6-)7-9(-12) µm
columella	"columella variable, flattened, conical, or elongated, usually contained within a spore or spore-like covering ... rarely lying between two or three spores fused to the peridial collar"	"[spore-like body, so-called columella by the authors] with a rather shallow thickened cuplike base, ...rarely with a small continuation of the stalk [columella] inside"
sporocarp height	150-250 µm	(100-)150-300(-350) µm

Table 1. Differences between original descriptions of E. apitectum and E. vanderpoelii

E. vanderpoelii was described to accommodate a number of specimens, found thorough the world, difficult to place into *E. apitectum* (Keller & Brooks, 1976: 1217; Eliasson et al.. 1988: 381; Pando, 1989: 183; Nannenga-Bremekamp et al., 1991:411). These authors report abnormal spore or sporocarp sizes for *E. apitectum.* This is not quite surprising if we recall that *E. apitectum* was described from a single locality.

In addition to several Iberian specimens, we have studied type material of both species to verify that specimens placed under both names as well as our specimens could fit reasonably well into a single species. We conclude that they do, and thus *E. vanderpoelii* is considered a synonym of *E. apitectum.* On the other hand, spore size and sporocarp size must be extended in the description of *E. apitectum* to accommodate the mentioned specimens.

Spore diameter overlaps as illustrated in the graph of fig. 9, which results are based on 14 measurements for NENB 14577 (all spores available in the microscope slide) and on at least 20 measurements for the remaining specimens.

Regarding the columella, a shallow thickened cuplike base is indistinguishable from a flattened collumela.

With the exception of 469 Lado –cited in Pando & Lado (1990)– all other studied Iberian specimens present spores mostly less than 9 µm in diam. It is also worthwhile to mention the variability in columella shape. In the extreme cases, the columella pierces the spore-like body and becomes a rudimentary capillitium (Fig. 6), or on the other end, flattens and merges with the collar, which then looks thick and pigmented.

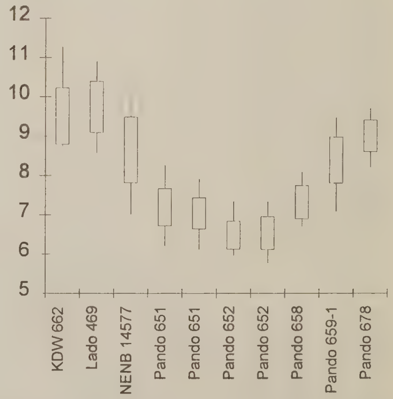


Fig. 9. Spore diam. in µm of studied specimens. Lines represent extreme values; boxes, mean plus/minus standard deviation.

The separation between forms with large (9-12 µm in diam.) spores and small [6-9(-10) µm in diam.] spores, which also are longer and slender, might deserve taxonomic recognition, but both variants merge and further evidence would be needed to prevent considering *E. apitectum* K.D. Whitney and *E. vanderpoelii* Nann.–Bremek. & al. as synonyms.

Echinostelium apitectum K.D. Whitney, Mycologia 72: 954. 1980
=*Echinostelium vanderpoelii* Nann.–Bremek., D.W. Mitch., T.N. Lakh. & R.K. Chopra, Proc. Kon. Ned. Akad. Wetensch. 94(3): 411. 1991.

Collections examined:

U.S.A. California: Lassen Co., 0.5 mi northeast of Eagle Lake Field Station, . On bark of *Juniperus occidentalis* KDW 662 (NY) [Isotypus of E. apitecum]. Ibidem KDW 650 (NY).

FRANCE. Bas Rhin, Kientzheim, on bark of *Aesculus,* 30-V-1984, Vander Poel FK 29.584, Nann.-Brem. no. 14577 [paratypus of *E. vanderpoelii*].

SPAIN. Guadalajara: Tamajón, ermita Virgen del Enebral, 30TVL7941, 1040 m.s.m. on bark of living *Juniperus turifera*, 7-IV-1981, 469 Lado, MA-Fungi 16888.

Huelva: Torre La Higuera, 29SQB1202, 25 m.s.m., on bark of living *Juniperus phoenicea*, C. Lado, 24-I-1989, 659-1 Pando, MA-Fungi 22639; ibidem, 26-I-1989, 650-1 Pando, MA-Fungi 22630; idem, 659-2 Pando, MA-Fungi 22639; ibidem, 27-I-1989, 650-2 Pando, MA-Fungi 22630; idem, 651 Pando, MA-Fungi 22631; ibidem, 31-I-1989, 658 Pando, MA-Fungi 22638; ibidem, 7-II-1989, 652 Pando, MA-Fungi 22632; ibidem, 10-II-1989, 648 Pando, MA-Fungi 22628.

Mallorca: De Pollensa a Mortixet, Vall de San Mach, 31SDE9713, 560 m.s.m., on bark of living *Olea europaea*, E. Descals, C. Lado, F. Pando, J. Portela & M.T. Tellería, 23-IV-1987, 438-1 Pando; ibidem, 25-IV-1987, 438-2 Pando; idem, 438-3 Pando, MA-Fungi 19206.

Soria: Torremocha de Ayllón, 30TVL7988, 1000 m.s.m., on bark of living *Juniperus thurifera,* 18-IV-1989, C. Lado & F. Pando, 678 Pando, MA-Fungi 22658.

Sporocarps, scattered or gregarious, 100-350 µm high, stalked, when fresh, hyaline or white (263. White) or grayish yellowish pink (32. gy. y Pink) or pale cinnamon*; sporotheca* globose, 30-48.75-65 µm in diam. *Hypothallus* inconspicuous. *Stalk* present, 70-290 µm long, 1-3 µm diam. at the apex, 10--22 µm diam. at the base, arising from a arising from a non expanded base, slightly flexousus, tapering to the apex, translucent, under transmitted light hyaline or pale yellow (89. p.Y) or strong yellow (84. s. Y), filled, with granular material, up to 1/2 or 2/3, or more. *Peridium* persisting basally, when mature, as a collar or a saucer-shaped calyculus, 3-10 µm in diam. *Capillitium* absent or rudimentary. *Columella* present or absent, flattened or conical or cylindrical or fusiform or pedunculate-hemispheric, up to 4.5 µm long, by transmitted light, light brown (57. l. Br) or black (267. Black). *Spores* free, in mass, hyaline or yellowish white (92. y. White), by transmitted light, hyaline or grayish yellowish pink (32. gy. y Pink) or light olive gray (112. l. Ol Gy), globose, 6-12 µm in diam., minutely, roughened or smooth*; spore ornamentation* regularly, evenly distributed*; spore wall* of uniform thickness*; spore-like body* present.

Acknowledgments

I am greatly indebted to late Mrs. N.E. Nannenga-Bremekamp for her advice, comments and lending me material of *L. vanderpoelii*. To Mr. D. Mitchell for his comments. To Prof. M. Härkönen for her critical review of the manuscript and sending the Turkish specimen. We also wish to thank Dr. M. Laínz S.J. for his Latin translation. This work was carried out within the *Flora Micológica Iberica* project, sponsored by DIGYCIT (PB92-0012).

Literature cited

ANONYMOUS (1976). ISCC-NBS Color-Name charts Illustrated with Centroid Colors. Inter-Society Color Council; National Bureau of Standards. Washington.

DÖRFELT, H. & MARX, H. (1991). Zur Terminologie der sporenbildenden Stadien der Myxomyceten. Beitr. Kenntn. Pilze Mitteleurop. 6: 5-14.

ELIASSON, U.H., KELLER, H.W. & HUTCHISON, J.A. (1988). Myxomycetes from Arkansas. Mycotaxon 32:375-398.

FONT QUER, P. (1953). Dicionario de Botánica. Labor. Barcelona.

HÄRKÖNEN, M. & UOTILA, P. (1983) Turkish Myxomycetes developed in moist chamber cultures. Karstenia 23:1-9.

KELLER, H.W. & BROOKS, T.E. (1977). Corticolous Myxomycetes V: Observations on the genus Echinostelium. Mycologia 68(6):1204-1220. [1976].

NANNENGA-BREMEKAMP, N.E., MITCHELL, D.W., LAKHANPAL, T.N. & CHOPRA, R.K. (1991). Echinostelium vanderpoelii: a new widespread Myxomycete. Proc. Kon. Ned. Akad. Wetensch. 94(3):411-413.

PANDO, F. (1989). Un estudio sobre los Myxomycetes corticícolas de la Isla de Mallorca. Anales Jard.Bot.Madrid 46(1):181-188.

PANDO, F. & LADO, C. (1990). A survey of the corticolous Myxomycetes in Peninsular Spain and Balearic Islands. Nova Hedwigia 50:127-137.

WHITNEY, K.D. (1980). The Myxomycete genus Echinostelium. Mycologia 72(5):950-987.

MYCOTAXON

Volume LXIV, pp. 349-352 September 1997

OLIGOPORUS RENNYI IN NORTH AMERICA

R.L. Gilbertson

Dept. of Plant Pathology, University of Arizona, Tucson, AZ 85721

and

Sam Ristich

81 Sligo Road, North Yarmouth, ME 04097

SUMMARY

Oligoporus rennyi is reported from North America. It was collected on a stump and fallen branches of spruce in Maine and was associated with a brown rot. A well developed basidiocarp was closely associated with a typical ptychogastric conidial stage. A description and line drawings of microscopic characters are provided.

The genus *Oligoporus* was proposed by Brefeld (1888) with *Oligoporus farinosus* Bref. designated as the type species. *Oligoporus farinosus* is now considered to be a later synonym of *Polyporus rennyi* Berk. & Broome (1875). Donk (1971) reviewed the nomenclatural history of this fungus and proposed the new combination *Oligoporus rennyi* (Berk. & Broome) Donk. Gilbertson and Ryvarden (1987) recognized the genus *Oligoporus* to include those polypores with annual basidiocarps that are resupinate or pileate, white to pale colored, have monomitic hyphal systems with clamps on generative hyphae, basidiospores that are allantoid to ellipsoid and negative in Melzer's reagent, and cause brown rots. Asexual spores (commonly referred to in the literature as chlamydospores) may be present but are unknown in most species. Gilbertson and Ryvarden included 23 species of *Oligoporus*, exclusive of *O. rennyi*. The purpose of this communication is to report and describe this species from North America. Microscopic characters were determined from free-hand sections and squash mounts in KOH and phloxine and in Melzer's reagent. Drawings were made with the aid of a camera lucida on a Leitz Labolux microscope. Capitalized color names are from Ridgway (1912).

OLIGOPORUS RENNYI (Berk. & Broome) Donk. Persoonia 6(2): 214. 1971.
Polyporus rennyi Berk. & Broome, Ann. Mag. Nat. Hist. Ser. IV, 15:31. 1875.

Poria rennyi (Berk. & Broome) Cooke, Grevillea 14:112. 1886.
Tyromyces rennyi (Berk. & Broome) Ryvarden, Svensk Bot. Tidskr. 68:281. 1974.

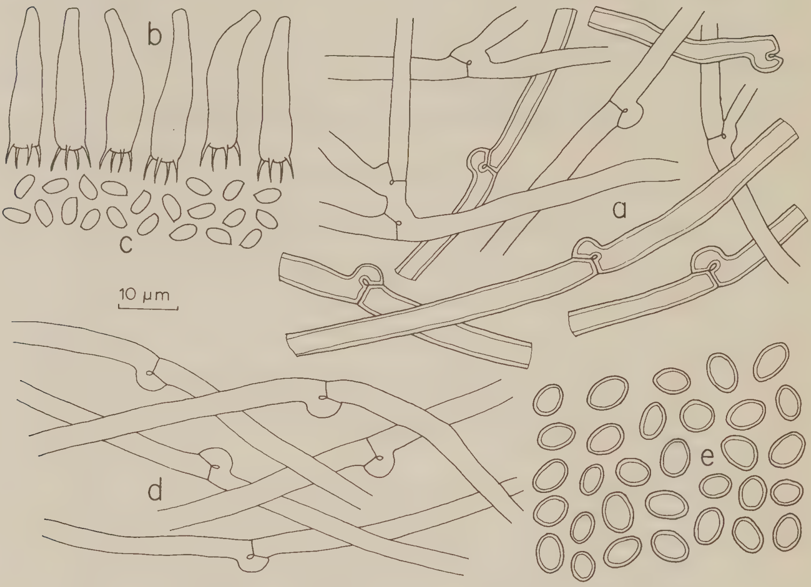


Fig. 1. *Oligoporus rennyi* (AZ 17751). a, subicular hyphae from teleomorph; b, basidia; c, basidiospores; d, hyphae from anamorph; e, chlamydospores.

Basidiocarps annual, resupinate, effused in small patches up to 1 cm wide, soft, easily removed from substratum; pore surface white, the pores angular, 2-3 per mm, with minutely fimbriate dissepiments that become thin and lacerate; sterile margin up to 5 mm wide, floccose, white; subiculum white, soft-cottony, azonate, up to 2 mm thick; tube layer white, soft, up to 3 mm thick.
Hyphal system monomitic; subicular hyphae hyaline, thin- to firm-walled, with clamps at all septa, with occasional branching, especially from clamps, 2.5-5 µm in diam; tramal hyphae similar, more uniformly thin-walled.
Cystidia or other sterile hymenial elements absent.
Basidia narrowly clavate, 4-sterigmate, 18-33 x 4.5-6 µm, with a basal clamp.
Basidiospores oblong to short-cylindric, hyaline, smooth, negative in Melzer's reagent, 4-5 x 2-2.5 µm.
Ptychogastric stage blending into basidiocarps, Sayal Brown to Tawny-Olive, appearing as a powdery mass in a matrix of filaments; hyphae hyaline, with thin to unevenly thickened walls, with clamps, 2.5-4 µm in diam, with rare branching;

chlamydospores Tawny-Olive in mass, pale greenish yellow under the compound microscope, subglobose to ellipsoid, thick-walled, negative in Melzer's reagent, 5-7.5 x 3.5-5 μm.
Type of rot. Brown cubical rot of dead conifers.

Specimens examined: MAINE: Sam Ristich, AZ016760 and AZ17751 on stump and fallen branches of *Picea abies* L. (Norway spruce), North Yarmouth, Cumberland County, Oct. 18, 1987 (ARIZ). GERMANY: Brinkmann, USO218016, on *Pinus* sp., Westfalia, no date (BPI). DENMARK: H. Hall-Anderson, on *Picea abies* and debris, Fanefjord skov, Oct. 17, 1976 (OSLO). SWEDEN: Anders and Kurt Hjortstam, on *Pinus sylvestris* L., Västergötland, Alingsås, Vikaryd, about 300 m WSW of the little lake Kråkevattnet, Sept. 4, 1979 (OSLO).

Oligoporus rennyi has been reported from several localities in Europe (Ryvarden and Gilbertson, 1994). Ryvarden (1978) previously recognized both *Tyromyces rennyi* and *T. ptychogaster* (C.A. Ludw.) Donk from North Europe. He differentiates *T. ptychogaster* on the basis of its pileate teleomorph and larger chlamydospores. For a discussion of the genus *Ptychogaster* and conidiogenesis in that genus see Sigler and Carmichael (1976). Jahn (1980, fig. 79) provides an excellent color photograph of *O. rennyi*, which he calls "mehlstaub-porling", a name bestowed on the fungus by Kallenbach (1934). Kreisel (1987) reports *O. rennyi* from the former Deutschen Demokratischen Republik, and Domański (1965) includes it as *Strangulidium rennyi* (Berk. & Broome) Pouzar but says conidia are verrucose and illustrates them as such. He also states that it occurs in North America on "deciduous wood." We have seen no specimens that substantiate that report. Reid and Austwick (1963) report *Poria rennyi* (Berk. & Broome) Cooke from Scotland.

ACKNOWLEDGMENTS

The authors thank Dr. A. Y. Rossman for the loan of specimens from the National Fungus Collections, Beltsville, MD. This is University of Arizona Agricultural Experiment Station Journal Article No. 7336.

LITERATURE CITED

DOMANSKI, S. 1965. Fungi. Polyporaceae I (resupinate); Mucronoporaceae I. In:Flora Polska (Grzyby) 2. 280 p. +63 pl.
DONK, M.A. 1971. Notes on European polypores- VIII. Persoonia 6(2):201-218.
GILBERTSON, R.L. and L. RYVARDEN. 1987. North American Polypores. Vol. II. *Megasporoporia -Wrightoporia.*, p. 434-885. Fungiflora, Oslo.
JAHN, H. 1979. Pilze die an Holz Wachsen. Busse. 268 p.
KALLENBACH, F.J. 1934. *Polyporus apalus* Lév., der "mehlstaub porling". Z. Pilzk. 18(3):66-71.

KREISEL, H. 1987. Pilzflora der Deutschen Demokratisches Republik. Gustav Fischer, Jena. 281 p.

POUZAR, Z. 1967. Studies in the taxonomy of the polypores III. Česka Mykol. 21:205-212.

REID, D.A. and P.K.C. AUSTWICK. 1963. An annotated list of the less common Scottish Basidiomycetes (exclusive of rusts and smuts). Glasgow. Nat. 18:255-336.

RIDGWAY, R. 1912. Color Standards, and Color Nomenclature. Published by the Author. Washington, D.C. 44 p. + 53 pl.

RYVARDEN, L. 1978. The Polyporaceae of North Europe. Vol. 2. *Inonotus-Tyromyces*. Fungiflora, Oslo. p. 215-507.

RYVARDEN, L. and R.L. GILBERTSON. 1994. European Polypores. Part 2. *Meripilus-Tyromyces*. Fungiflora, Oslo. p. 388-473.

SIGLER, L. and J.W. CARMICHAEL. 1976. Taxonomy of *Malbranchea* and some other hyphomycetes with arthroconidia. Mycotaxon 4:349-488.

MYCOTAXON

Volume LXIV, pp. 353-359 September 1997

NOTES ON *WOLFIPORIA DILATOHYPHA* IN NORTH AMERICA

Robert L. Gilbertson and **Donna M. Bigelow**

Department of Plant Pathology, University of Arizona, Tucson, AZ 85721

SUMMARY

Wolfiporia dilatohypha, previously known from eastern North America only, is reported from Arizona on fallen silverleaf oak. Distinctive cultural characters include lack of clamps, profuse development of arthrospores and chlamydospores, and negative oxidase reactions. Agar block decay tests with silverleaf oak and white fir test blocks resulted in little change in weight or appearance of the blocks.

Overholts (1939) described *Poria inflata* from dead wood of oak and elm in Ohio and Missouri. Unfortunately, he did not follow the International Rules of Botanical Nomenclature which requires a Latin diagnosis with new taxa described after Jan. 1, 1935, so *Poria inflata* is an illegitimate name. Nevertheless, this name was used by subsequent workers including Overholts (1942), Davidson et al. (1942), Lowe (1946, 1958, 1966), Lowe and Gilbertson (1961), and Lowe (1966). Ryvarden and Gilbertson (1984) redescribed the fungus and provided the legitimate name *Wolfiporia dilatohypha*.

Records of this fungus to date indicate a reported geographical range in the eastern U.S. from Florida, Michigan, Missouri, New York, Ohio, east Texas, and West Virginia (Gilbertson and Ryvarden 1987). It has not been reported from western North America or elsewhere in the world. Recent collections of *W. dilatohypha* in southern Arizona indicate it has a considerably greater geographical range than previously known. The occurrence in southern Arizona of wood-rotting fungi known otherwise only in eastern or southeastern United States is well documented. Examples are *Donkia pulcherrima* (Berk. & M.A. Curtis) Pilát (Gilbertson 1974), *Vararia fibra* Welden (Gilbertson and Lindsey 1978), *V. tropica* Welden (Gilbertson et al. 1976), and others.

Davidson et al. (1942) isolated *W. dilatohypha* from nine living oaks in which it caused a brown heartrot and described its cultural characters. The cultural morphology of the Arizona isolate agrees well with that given by Davidson et al.

Specimens examined: ARIZONA- RLG 16012, 16014, Sept. 3, 1986, 21668, 21669, Sept. 4, 1996, on *Quercus hypoleucoides* A. Camus (silverleaf oak), Madera Canyon, Santa Rita Mts., Coronado Nat. Forest, Santa Cruz County (ARIZ 012871, 012872, 028951, 028952). MICHIGAN- W.B. Cooke 30186, Warren Woods State Preserve, Berrien County, on unidentified hardwood, Sept. 4, 1955 (ARIZ 009682): Mr. Voight, MICH 3464, on *Platanus occidentalis* L.,

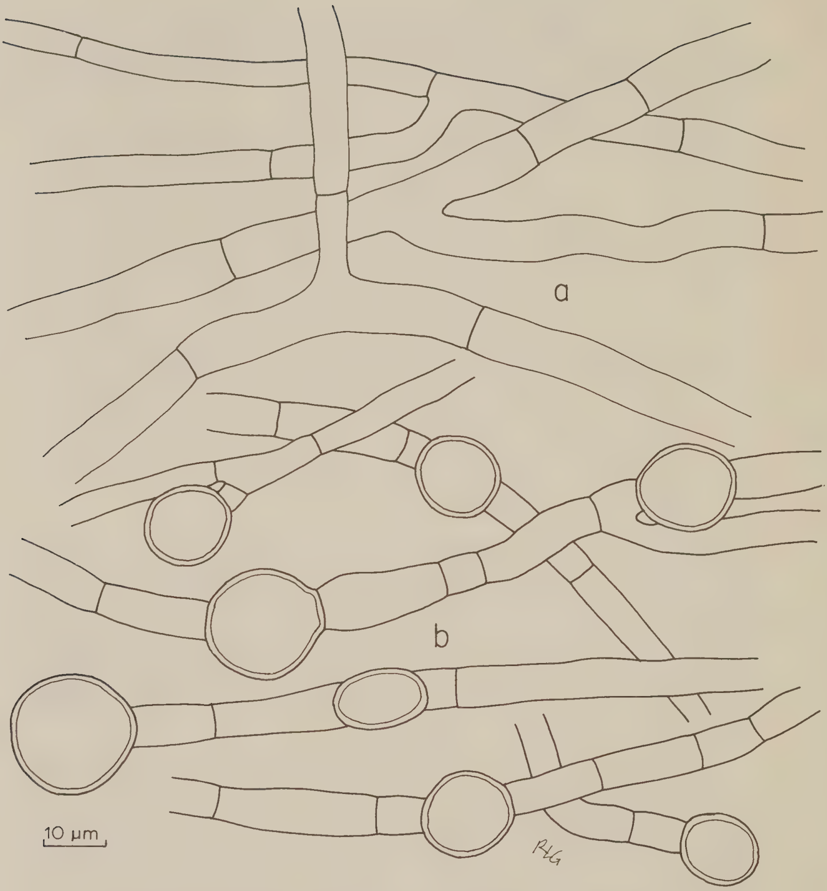


Fig. 1. *Wolfiporia dilatohypha* (RLG 16012). a, hyphae of advancing zone; b, hyphae of submerged mycelium with chlamydospores.

Ann Arbor, Washtenaw County, Sept., 1912 (BPI US0240357); C.H. Kauffman, on inside of elm stump, Whitmore Lake Rd., Ann Arbor, Washtenaw County, Oct. 17, 1921 (BPI US0240359, ex herb. MICH); C.H. Kauffman 27, on sycamore, Ann Arbor, Washtenaw County, no date (PACMA LOO 7367 ex herb. MICH). MISSOURI- L.O. Overholts 613, on old log, Creve Coeur, St. Louis County, Oct. 11, 1913 (PACMA); E.A. Burt, LOO 1763, on stump of upturned tree, Creve Coeur, St. Louis County, Dec. 6, 1913 (PACMA). OHIO- L.O. Overholts 279, on oak, Oxford, Butler County, Nov. 21, 1911 (ISOTYPE, BPI US0240358, HOLOTYPE, PACMA 658); B. Fink, LOO 267, on inside of hollow maple tree, Oxford, Butler County, Oct. 25, 1911 (PACMA); F.O.

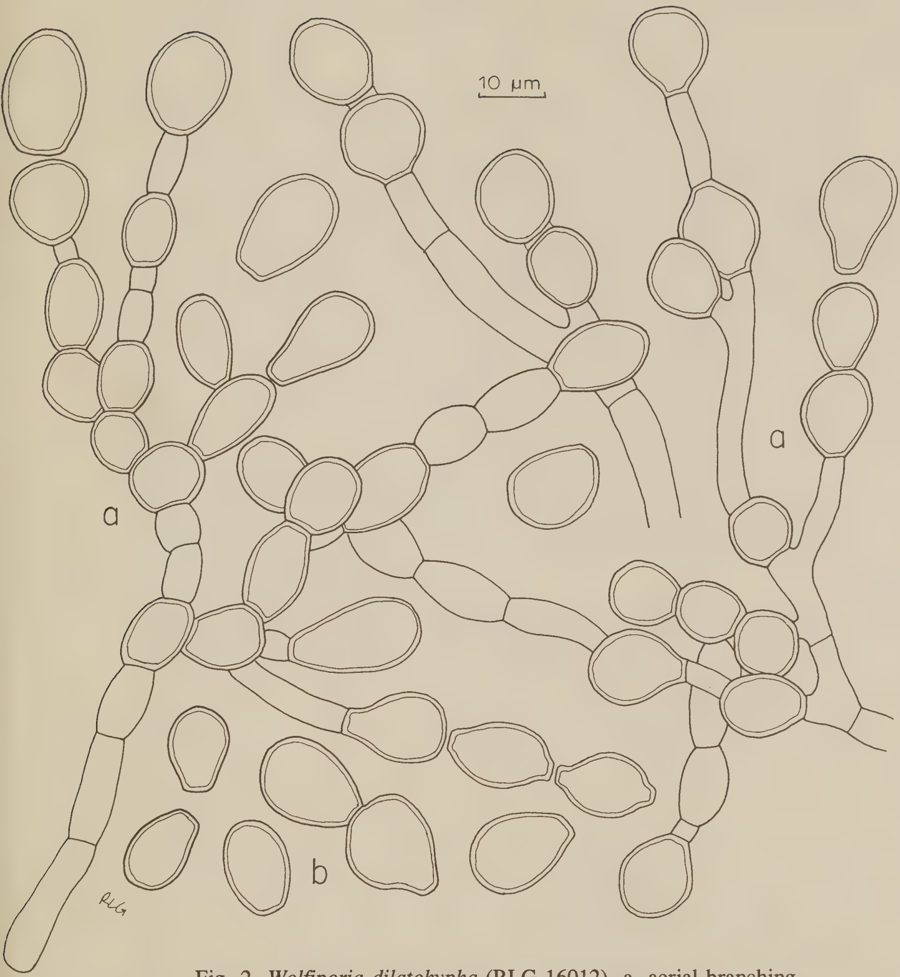


Fig. 2. *Wolfiporia dilatohypha* (RLG 16012). a, aerial branching hyphae producing chlamydospores; b, free chlamydospores.

Grover, LOO 17435, on much decayed log of *Ulmus americana*, Black Swamp, New Oberlin, Lorain County, Sept. 21, 1925 (PACMA, ex herb. OC, Fungi of Lorain County, Ohio No. 4174). TEXAS- M. Blackwell 769 and 770, on *Quercus* sp. (oak), Pine Island Bayou and Willow Creek, Jefferson-Hardin County line, Sept. 5, 1982 (ARIZ 009683 and 009684). WEST VIRGINIA- W.A. Campbell and R.W. Davidson, on butt of down red oak log with brown rot, 5 mi south of Lewisburg, Greenbrier County, Oct. 31, 1940 (CFMR FP94089, PACMA).

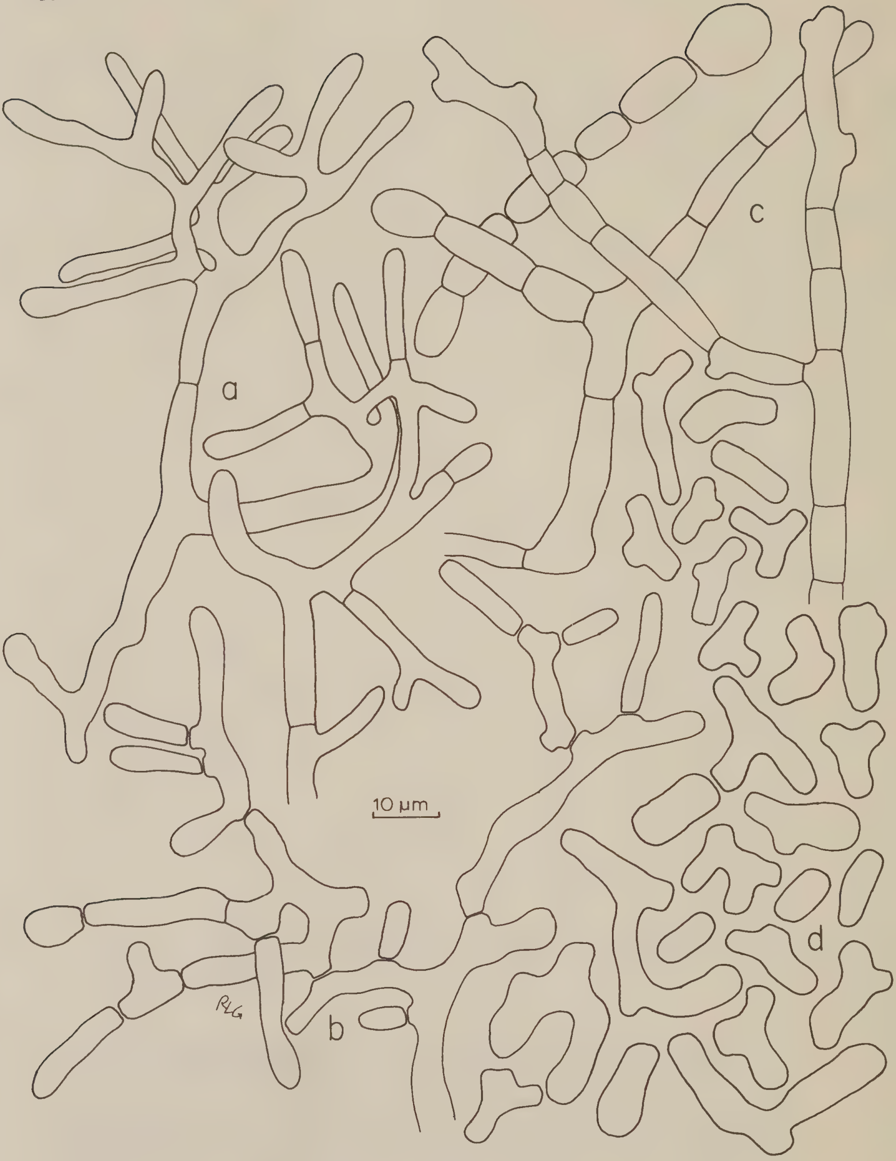


Fig. 3. *Wolfiporia dilatohypha* (RLG 16012). a, erect branching hypha from aerial mycelium prior to differentiation into arthrospores; b and c, aerial branching hyphae in various stages of differentiation into arthrospores; d, arthrospores.

An isolate was obtained from Arizona collection 16012 from basidiocarp tissue. Cultural characteristics of this isolate were determined and the species code reported according to the procedures of Nobles (1965).

Cultural characters:
Growth characters: Growth moderately rapid, plates covered in 3-4 weeks; advancing zone even, scant aerial mycelium present almost to the limit of growth; mat white, extremely thin, appressed, with scattered small tufts of mycelium that give a farinaceous or mealy appearance, mostly appressed and small tufts clearly discernible only by transmitted light; submerged mycelium faintly feathery in appearance by transmitted light; reverse unchanged; odor not distinctive; on gallic and tannic acid media diffusion zones absent, growth on tannic acid media only a trace after 2 wk, on gallic acid agar 5-7 mm in 1 wk, plates covered in 2 wk.
Microscopic characters: Advancing zone; hyphae simple-septate, 5-7 μm in diam, hyaline, thin-walled, some staining in phloxine, others appearing empty and colorless, with occasional branching (Fig. 1).
Aerial mycelium; mostly appressed but with abundant small aerial tufts composed of branching complexes that produce chlamydospores and arthrospores (Figs. 2 and 3).
Submerged mycelium; hyphae hyaline, thin-walled, simple-septate, occasionally branched, 5-8 μm in diam; chlamydospores, ellipsoid to ovoid or subglobose, 10-20 μm in diam, scattered but frequent, thick-walled, smooth, hyaline, staining in phloxine (Fig. 1); arthrospores irregular in shape, often branched or lobed, hyaline, 2.5-8 μm in diam (Fig. 2).
Species code: 1.6.7.34.35.36.38.43.44.54.
Additional cultures examined: J.L. Lowe 14122-Sp, on *Pinus strobus* stump, Warrensburg, NY, Sept. 25, 1965; FP-94089-R and FP-94089-T, on *Quercus rubra*, Lewisburg, WV, Oct. 31, 1940 (CFMR).

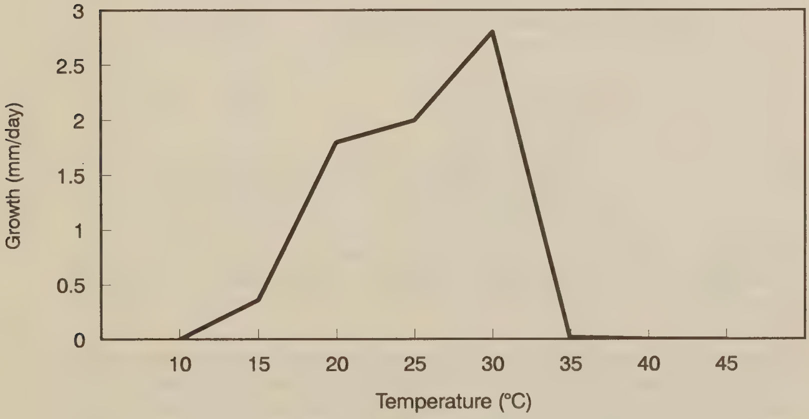


Fig. 4. *Wolfiporia dilatohypha* (RLG 16012). Growth rate at temperatures from 10° to 45°C.

Temperature relationships: Temperature relationships were determined by growing isolate 16012 on 2 percent malt extract agar at temperatures from 10°C to 45°C at 5 degree intervals. Growth occurred from 15°C to 30°C with optimum growth at 30°C (2.8 mm/day). There was almost no growth at 35°C and none at higher temperatures (Fig. 4).

Decay studies:
Isolate 16012 was used in decay tests on blocks of silverleaf oak (*Quercus hypoleucoides* A. Camus) and white fir (*Abies concolor* (Gord. & Glend.) Lindl. ex Hildebr.). Wood blocks were cut from sapwood of trunk segments from living trees cut in forest ecosystems in Arizona. The blocks were oven dried at 110°C for 48 hr, placed in a desiccator for 24 hr and weighed. The blocks were soaked and autoclaved for 1 hr at 15 PSI. They were then placed on previously inoculated feeder strips on the surface of vermiculite in 8 oz French decay chambers. Five chambers with the fungus and a control chamber without the fungus were set up for wood blocks of each of the two species at 20°C, 25°C and 30°C. The chambers were then placed in incubators for 20 weeks at the three temperatures. At the end of that period the blocks were removed from the chambers, surface mycelium was removed with a brush, and the blocks were oven dried and weighed as before. Percent weight loss was calculated by dividing the difference between oven dry weight before and after decay by the oven dry weight before decay. The results are shown in Table 1.

Table 1. Percent weight loss in control and *in vitro* decayed wood by *Wolfiporia dilatohypha* isolate RLG 16012.

Wood type	Treatment	Percent weight loss*
White fir	Control at 25°C	0.19
	Wolfiporia dilatohypha at 25°C	1.82±0.58
Oak	Control at 20°C	2.60
	Control at 25°C	2.33
	Control at 30°C	1.22
	Wolfiporia dilatohypha at 20°C	10.90±1.68
	W. dilatohypha at 25°C	7.26±1.92
	W. dilatohypha at 30°C	9.76±1.78

* Average percent weight loss determined from replications after 20 weeks at 20. 25, or 30°C.

The amount of decay as indicated by weight loss was relatively low and there was no indication of a typical brown rot in the decay blocks after 20 weeks. This was surprising as *W. dilatohypha* has been reported as causing a brown rot by Davidson et al. (1942) and subsequent authors. Brown rot fungi generally cause conspicuous distortion and softening of test blocks in decay tests after 20 weeks and the typical brown cubical rot is apparent. Blocks oven dried after decay for

20 weeks by brown rot fungi usually show drastic shrinkage and cracking across the grain. The blocks with *W. dilatohypha* in this test displayed none of these characteristics and looked essentially unchanged after the decay period. *Wolfiporia dilatohypha* does not give a positive phenoloxidase reaction on gallic or tannic acid media or with gum guaiac solution. This in itself does not rule out the possibility that it is a white rot fungus as other well known white rot fungi such as *Bjerkandera adusta* and *B. fumosa* (Nobles, 1948), and *Ceriporiopsis* (as *Poria*) *carnegiea* (Gilbertson and Canfield, 1972) also show negative phenoloxidase reactions with the same techniques.

ACKNOWLEDGMENTS

We thank D.F. Farr at the National Fungus Collections, Beltsville, MD and C.B. Wolfe, Jr. at the Overholts Herbarium, Pennsylvania State Univ. at Mont Alto for the loan of specimens. Thanks are also due to C.R. Bergman at the Center for Forest Mycology Research, Forest Disease Laboratory, USFS, Madison, WI for the loan of specimens and also for cultures of *W. dilatohypha*.

LITERATURE CITED

DAVIDSON, R.W., W.A. CAMPBELL, and D.B. VAUGHN. 1942. Fungi causing decay in living oaks in the eastern United States and their cultural identification. USDA Tech. Bull. 785:1-65. **GILBERTSON, R.L.** 1974. Fungi that Decay Ponderosa Pine. Univ. of Arizona Press. 198 p. **GILBERTSON, R.L., H.H. BURDSALL, JR., and E.R. CANFIELD**. 1976. Fungi that decay mesquite in southern Arizona. Mycotaxon 3:487-551. **GILBERTSON, R.L. and E.R. CANFIELD**. 1972. *Poria carnegiea* and decay of saguaro cactus in Arizona. Mycologia 64:1300-1311. **GILBERTSON, R.L. and L. RYVARDEN**. 1987. North American Polypores. Vol. 2. *Megasporoporia-Wrightoporia*. p. 434-885. Fungiflora, Oslo. **LINDSEY, J.P. and R.L. GILBERTSON**. 1978. Basidiomycetes that Decay Aspen in North America. Biblio. Mycol. 63:1-406. **LOWE, J.L.** 1946. The Polyporaceae of New York State (the genus *Poria*). New York State Coll. Forestry Tech. Publ. 65:1-91. **LOWE, J.L.** 1958. The genus *Poria* in North America. Lloydia 21:100-113. **LOWE, J.L.** 1966. Polyporaceae of North America. The genus *Poria*. State Univ. New York Coll. Forestry Tech. Publ. 90:1-183. **LOWE, J.L. and R.L. GILBERTSON**. 1961. Synopsis of the Polyporaceae of the southeastern United States. J. Elisha Mitchell Sci. Soc. 77:43-61. **NOBLES, M.K.** 1948. Studies in forest pathology. VI. Identification of cultures of wood-rotting fungi. Canad. J. Res. C, 26:281-431. **NOBLES, M.K.** 1965. Identification of cultures of wood-inhabiting Hymenomycetes. Canad. J. Bot. 43:1097-1139. **OVERHOLTS, L.O.** 1939. New or little known species of *Poria*. Proc. Pennsylvania Acad. Sci. 13:121-125. **OVERHOLTS, L.O.** 1942. Polyporaceae of Pennsylvania. The genus *Poria*. Pennsylvania State Coll. Agric. Exp. Sta. Bull. 418:1-64. **RYVARDEN, L. and R.L. GILBERTSON**. 1984. Type studies in the Polyporaceae 15. Species described by L.O. Overholts, either alone or with J.L. Lowe. Mycotaxon 19:137-144.

MYCOTAXON

Volume LXIV pp. 361-364 September 1997

TWO NEW COMBINATIONS: *AMYLOFUNGUS GLOBOSPORUS* AND *GLOEOMYCES MONILIFORMIS*

Sheng-Hua Wu

Division of Collection and Research, National Museum of Natural Science,
Taichung, Taiwan, R.O.C.

ABSTRACT

New combinations of two species originally described in *Vesiculomyces* are proposed. *Amylofungus globosporus* comb. nov. has characters of the genus *Amylofungus*: amyloid hyphae, gloeocystidia, basidia, and basidiospores; moreover with simple-septate hyphae, utriform basidia, and smooth-walled basidiospores. *Gloeomyces moniliformis* comb. nov. has all features of the genus *Gloeomyces*: dimitic hyphal system with simple-septate generative hyphae and binding hyphae, moniliform gloeocystidia, utriform basidia, and smooth-walled basidiospores which are amyloid. Key to *Gloeomyces* species is provided. *Gloeomyces moniliformis* is recorded from Taiwan for the first time.

INTRODUCTION

Gloeocystidiellum Donk em. Donk (Donk 1956) encompassed resupinate basidiomycetes normally with a smooth hymenial surface, monomitic hyphal system, euhymenium, gloeocystidia and amyloid basidiospores. The concept of this genus has long been regarded as heterogeneous (Donk, 1956, 1964; Eriksson and Ryvarden, 1975). Further subdivisions and new genera have later been recognized by mycologists. Many of the segregated genera (e.g., *Boidinia* Stalpers & Hjortstam, *Conferticium* Hallenb., *Gloiothele* Bres., *Megalocystidium* Jülich) were accepted by Ginns and Freeman (1994) and Wu (1996) after detailed studies on morphology and cultures. For the separation of the genera in the *Gloeocystidiellum* complex, see Ginns and Freeman (1994), Wu (1995), and Wu (1996).

Maekawa (1994) proposed two new species of *Gloeocystidiellum* s.l. from Japan, namely *Vesiculomyces globosporous* Maekawa and *V. moniliformis* Maekawa. Maekawa treated them in the genus *Vesiculomyces* Hagström because both have simple-septate hyphae and smooth-walled basidiospores. Recently, Ginns and Freeman (1994) and Wu (1996) have recognized *Vesiculomyces* as a later synonym of *Gloiothele*. After studying holotypes of these names, I think that they are better placed in other genera. Thus new combinations are proposed below.

TAXONOMY

Amylofungus globosporus (Maekawa) Sheng H. Wu, comb. nov.

Basionym: *Vesiculomyces globosporus* Maekawa, Rept. Tottori Mycol. Inst. 32: 32. 1994.

Specimen examined. Japan. Hokkaido: Tokoro-gun, Saroma-cho, Horoiwayama, on decaying wood of a broad-leaved tree, leg. N. maekawa, 27-IX-1984, *TMI-12769* (holotype, deposited at TMI).

Distribution. Known only from Japan.

Remarks. Description and line drawing of this species have been properly provided by Maekawa (1994). The holotype of *Vesiculomyces globosporus* has characters typical of the genus *Amylofungus* Sheng H. Wu, *i.e.* amyloid reaction for all elements in the basidioma: hyphae, gloeocystidia, basidia, and basidiospores. Simple-septate hyphae, utriform basidia (Fig. 1), and smooth-walled basidiospores are also important characters of this genus. However, the amyloid reaction for hyphae, gloeocystidia, and basidia were not reported by Maekawa (1994). *Amylofungus corrosus* (G. Cunn.) Sheng H. Wu, the type species for *Amylofungus*, differs in having shorter gloeocystidia and smaller basidiospores. Gloeocystidia of *A. globosporus* were measured by Maekawa (1994) as 70-120 µm long, and those of *A. corrosus* were measured by Wu (1995) as 20-60 µm long. Basidiospores of *A. globosporus* were measured by Maekawa (1994) as 7.5-10.5 x 7-9.5 µm, and those of *A. corrosus* were measured by Wu (1995) as 5.5-6.5(-7) x 4.5-5.5 µm.

Gloeomyces moniliformis (Maekawa) Sheng H. Wu, comb. nov.

Basionym: *Vesiculomyces moniliformis* Maekawa, Rept. Tottori Mycol. Inst. 32: 37. 1994.

Specimens examined. Japan. Tottori Pref.: Tottori City, Ochidani, on decaying branch of a broad-leaved tree, leg. N. Maekawa, 10-X-1983, *TMI-12772* (holotype, deposited at TMI). Taiwan. Hsinchu: Kuanwu, alt. 1 900 m, on culm of Poaceae, leg. S.H. Wu, 24-VIII-1988, *Wu 880824-57* (National Museum of Natural Science, ROC); Chiayi: Yushan National Park, Nanhsi Forest Road, alt. 2 100 m, on branch of angiosperm, leg. S.H. Wu & J.Y. Tseng, 14-X-1994, *Wu 9410-54* (National Museum of Natural Science, ROC).

Distribution. Japan and Taiwan.

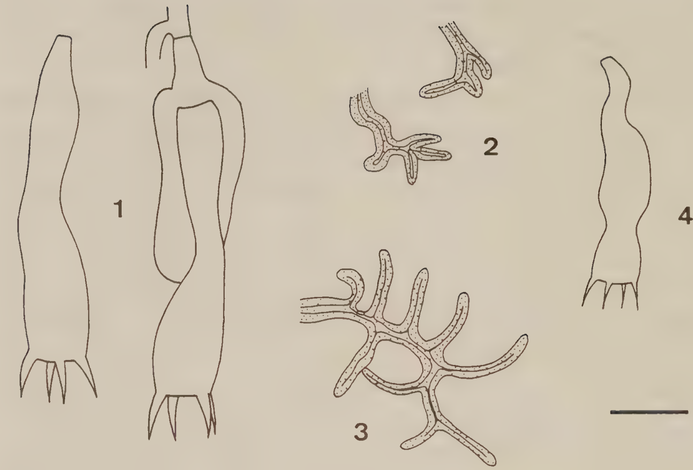
Remarks. Description and line drawing of this species have been adequately provided by Maekawa (1994). This species has all features typical of the genus *Gloeomyces*: dimitic hyphal system with simple-septate generative hyphae and binding hyphae (Figs. 2-3), moniliform gloeocystidia, utriform basidia (Fig. 4), and smooth basidiospores which are amyloid. *Gloeomyces* Sheng H. Wu was proposed by Wu (1996) for two species from Taiwan, *i.e. G. ginnsii* Sheng H. Wu and *G. graminicola* Sheng H. Wu. The latter is type of the genus. However, the binding hyphae in holotype and two Taiwanese specimens of *G. moniliformis* are very rare and usually difficult to find. Secondary mycelium of *G. graminicola* was reported by Wu (1996) as mostly dikaryotic, but rarely with 3 nuclei in a cell. This condition resembles the holocoenocytic nuclear behavior but with fewer nuclei per cell. In this study, secondary mycelium of *G. moniliformis* derived from the woody substratum of specimen *Wu 9410-54* was usually dikaryotic, rarely with 3 or 4 nuclei (see method of nuclear staining in Wu (1996)). The similar nuclear behavior of *G. graminicola* and *G. moniliformis* indicates their close relationship.

Key to species of *Gloeomyces*

1. Basidiospores > 9.5 µm long .... *G. ginnsii*
1. Basidiospores mostly < 9.5 µm long 2
2. Basidiospores > 7 µm long... *G. moniliformis*
2. Basidiospores < 7 µm long... *G. graminicola*

ACKNOWLEDGEMENTS

The author is indebted to Dr. Maekawa for arranging loan of type specimens, and to Dr. Ginns for offering valuable suggestions on the manuscript. This study was supported by National Science Council of ROC (No. NSC 82-2311-B-178-001).



Figures 1-4. *Amylofungus globosporus*. 1. Utriform basidia (holotype). *Gloeomyces moniliformis*. 2. Binding hyphae (holotype). 3. Binding hypha (*Wu 880824-57*). 4. Utriform basidia (*Wu 880824-57*). Scale bar = 10 µm.

REFERENCES

Donk, M.A. 1956. Notes on resupinate Hymenomycetes. III. Fungus 26: 3-24.

Donk, M.A. 1964. A conspectus of the families of Aphyllophorales. Persoonia 3: 199-324.

Eriksson, J. and L. Ryvarden. 1975. The Corticiaceae of North Europe III. *Coronicium - Hyphoderma.* Pp. 285-546. Fungiflora, Oslo.

Ginns, J.H. and G.W. Freeman. 1994. The Gloeocystidiellaceae (Basidiomycota, Hericiales) of North America. Biblioth. Mycol. 157: 1-118.

Maekawa, N. 1994. Taxonomic study of Japanese Corticiaceae (Aphyllophorales) II. Rept. Tottori Mycol. Inst. 32: 1-123.

Wu, S.H. 1995. Two new genera of corticioid basidiomycetes with gloeocystidia and amyloid basidiospores. Mycologia 87: 886-890.

Wu, S.H. 1996. Studies on *Gloeocystidiellum* sensu lato (Basidiomycotina) in Taiwan. Mycotaxon 58: 1-68.

MYCOTAXON

Volume LXIV, pp. 365-374 September 1997

SYMPODIOPLANUS, A NEW ANAMORPH GENUS FROM SOUTH AFRICA

R.C. SINCLAIR, SANETTE BOSHOFF and A. EICKER

Department of Botany, University of Pretoria, Hillcrest, 0001, Republic of South Africa

Abstract

Sympodioplanus capensis gen. et sp. nov. R.C. Sinclair & Boshoff is described from collections made in the Western Cape region on dead, decorticated wood in advanced stages of decay. Problems regarding taxonomic characters used to delimit nine other similar genera are discussed.

KEY WORDS: *Sympodioplanus*; new genus; South African anamorphic microfungi; sympodial proliferation.

Introduction

Anamorphic microfungi with sympodial proliferation represent a large group. The nature of conidiogenesis associated with the sympodial elongation of the conidiogenous region results in a variety of morphological patterns. These include distinct variations in the degree of geniculation of the conidiophore, the distance between conidiogenous scars, the thickness and prominence of the scars, and the conidium morphology, including wall texture, wall thickness and septation type. Many of the recognized genera represent heterogeneous agglomerations of taxa that are probably unrelated and are admitted to be so by some of their authors (Kirk 1981; Hughes 1989).

In the course of continued collection and identification of anamorphic microfungi on woody substrates, we have found a fungus that can not readily be classified in any of the known genera of anamorphic microfungi that demonstrate sympodial proliferation. In this paper, a new genus, *Sympodioplanus* R.C. Sinclair & Boshoff is established to accommodate anamorphic microfungi that 1) exhibit sympodial proliferation with multiple conidiogenous loci that are close together; 2) have moderate (mostly less than 45 degrees) geniculation of the conidiophore; 3) have conidiogenous loci that are flat in relation to the conidiophore wall, the conidia thus projecting laterally in relation to the main axis of the conidiophore; 4) have conidiogenous loci that are equivalent in thickness to the associated conidiophore wall; 5) form solitary conidia which are morphologically characterized by having cell walls similar to the walls of the apical region of the conidiophore; and 6) produce

elongated conidia with true septa. Nine other genera with sympodial proliferation are discussed with respect to these characteristics, namely *Catenosubulispora* Matsush., *Chikaneea* B. Sutton, *Cylindrosympodium* W.B. Kendr. & R.F. Castañeda, *Parasympodiella* Ponnappa, *Polyscytalum* Riess, *Pseudospiropes* M.B. Ellis, *Solosympodiella* Matsush., *Subulispora* Tubaki and *Sympodiella* W.B. Kendr.

Taxonomic Part

Sympodioplanus R.C. Sinclair et Boshoff gen. nov.

[Etymology: L. *planus* - flat, in respect of the flat, even appearance of the conidiogenous loci that are sympodially arranged on the conidiophores.]

Coloniae effusae, sparsae, brunneae, pilosae, plerumque inconspicuae, albae ubi maturae propter sporas. **Mycelium** plerumque in substrato immersum, ex hyphis ramosis, septatis, hyalinis vel brunneis, laevibus compositum. **Conidiophora** macronemata, mononemata, solitaria vel gregaria, erecta, simplicia, recta vel modice geniculata (plerumque minus quam 45 gradus), septata, brunnea, apicem versus pallidiora, laevia. **Cellae conidiogenae** holoblasticae, polyblasticae, in conidiophoris incorporatae, terminales, sympodiales, tenui-parietatae, laeves, in geniculis et apice cicatrices numerosas atque approximatas praebentes. Cicatrices planae, a pariete cellae conidiogenae contiguae non prominentes neque incrassatae. **Conidia** solitaria, sicca, elongata, ad basim truncata, hyalina vel pallide brunnea, euseptata, laevia, crassitie parietis crassitiei parietis cellae conidiogenae simili.

Species typica: *Sympodioplanus capensis* R.C. Sinclair et Boshoff.

Colonies effuse, sparse, brown, hairy, mostly inconspicuous, white when mature due to spores. **Mycelium** mostly immersed in the substrate, composed of branched, septate, hyaline to brown, smooth hyphae. **Conidiophores** macronematous, mononematous, solitary or in groups, erect, simple, straight or moderately geniculate (mostly less than 45 degrees), septate, brown, paler towards the apex, smooth. **Conidiogenous cells** holoblastic, polyblastic, integrated, terminal, sympodial, thin-walled, smooth, bearing multiple, closely approximated scars at the points of geniculation and at the apex. Scars are flat, not protruding from the conidiogenous cell wall and not thickened. **Conidia** solitary, dry, elongated with truncate base, hyaline to pale brown, euseptate, smooth, wall thickness similar to that of the conidiogenous cell wall.

Sympodioplanus capensis R.C. Sinclair et Boshoff, sp. nov. (Plate 1, Figs. 1-6).

Coloniae effusae, sparsae, brunneae, pilosae, plerumque inconspicuae, albae ubi maturae propter sporas. **Mycelium** plerumque in substrato immersum, ex hyphis ramosis, septatis, hyalinis vel brunneis, laevibus 1.5 - 2.4 μm crassis compositum. **Conidiophora** macronemata, mononemata, solitaria vel gregaria, erecta, simplicia, recta vel modice geniculata (plerumque minus quam 45 gradus), septata, brunnea, apicem versus pallidiora, laevia, usque ad 65 μm longa, 3 - 4 μm crassa. **Cellae conidiogenae** holoblasticae, polyblasticae, in conidiophoris incorporatae, terminales,

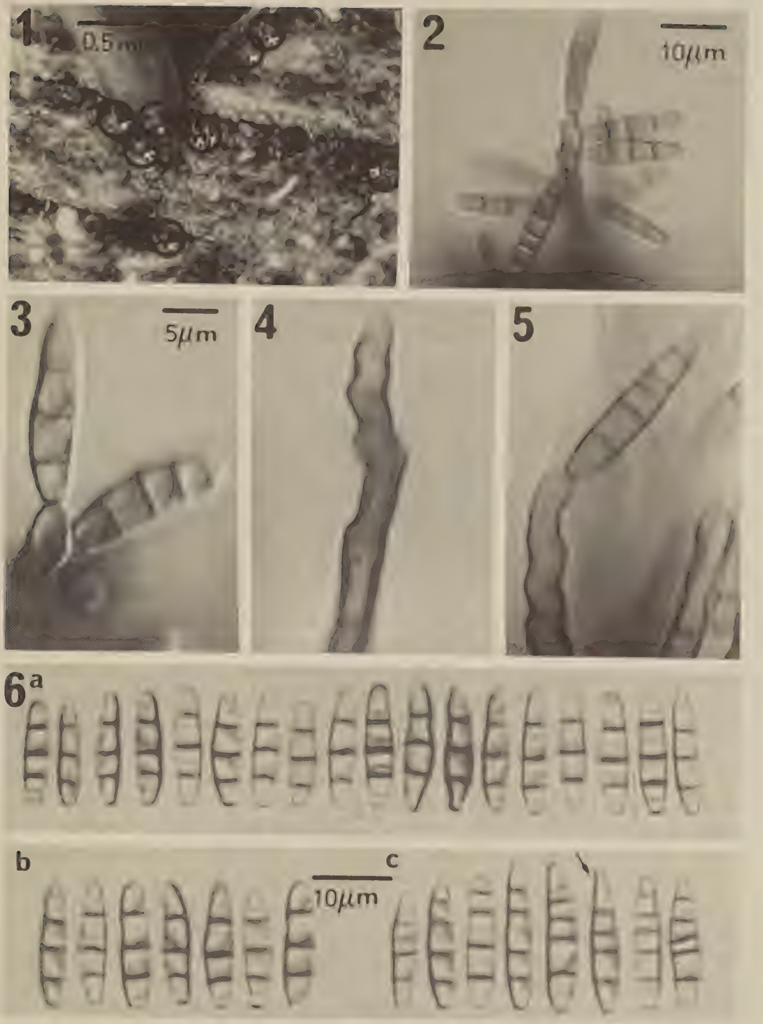


Plate 1: (1) Colony on natural substrate (a 27 gauge needle shaft is in the upper left corner, conidiophores are circled and indicated with white arrows);(2) demonstration of the disposition of the conidia on the conidiophore; (3) mature conidia on a conidiophore; (4) conidiophore morphology (same scale as 3); (5) uncommon (cf. Fig. 6c) conidium on a conidiophore (same scale as 3); (6) a) + b) normal range of conidium morphology c) uncommon 4- and 5-septate conidia (arrow denotes rare apex attenuation).

sympodiales, tenui-parietatae (usque ad 1 μm), laeves, in geniculis et apice cicatrices numerosas atque approximatas praebentes. Cicatrices planae, a pariete cellae conidiogenae contiguae non prominentes neque incrassatae, 1.5 - 2.2 μm latae. **Conidia** solitaria, sicca, plerumque naviculiformia, ad basim truncata, marginibus interdum irregularibus, ad apicem rotundata et raro parum attenuate, hyalina vel pallide brunnea, laevia, plerumque tri-, interdum quadri- vel quinque-euseptata, 13 - 16 X 2.5 - 4.0 μm, tenui-parietata, raro usque ad 19 μm longa.

In lignis emortuis decorticatis, saepe interspersus conidiophoris *Pseudospiropedis sp.*, in regione naturaliter silvestri prope rivulum, Constantia Neck, Kirstenbosch, Western Cape Province, South Africa, 2 July 1994, R.C. Sinclair, PREM 55315, holotypus.

Colonies effuse, sparse, brown, hairy, often inconspicuous, white when mature due to spores. **Mycelium** mostly immersed in the substrate, composed of branched, septate, hyaline to brown, smooth, 1.5 - 2.4 μm wide hyphae. **Conidiophores** macronematous, mononematous, solitary or in groups, erect, simple, straight or moderately geniculate (mostly less than 45 degrees), septate, brown, paler towards the apex, smooth, up to 65 μm long, 3 - 4 μm wide. **Conidiogenous cells** holoblastic, polyblastic, integrated, terminal, sympodial, thin-walled (up to 1 μm), smooth, bearing multiple, closely approximated scars at the points of geniculation and at the apex. Scars are flat in relation to the adjacent conidiogenous cell wall and not thickened, 1.5 - 2.2 μm wide. **Conidia** solitary, dry, mostly naviculiform with truncate base, margins sometimes irregular, at the apex mostly rounded and rarely slightly attenuate, hyaline to pale brown, smooth, mostly three, sometimes four or five-euseptate, 13 - 16 X 2.5 - 4 μm, thin-walled, in rare instances up to 19 μm long.

On dead, decorticated wood, often interspersed with conidiophores of *Pseudospiropes* sp.; South Africa.

Collections examined: wooded area near stream, Constantia Neck, Kirstenbosch, Western Cape Province, 2 July 1994, R.C. Sinclair, PREM 55315, holotype.

Discussion

Conidia in *Sympodioplanus* are produced holoblastically and are delimited by a septum early in their formation. They mature by apical and diffuse wall building. Conidia secede schizolytically. Conidiogenous cell proliferation and conidia maturation are simultaneous. Conidiogenous cell proliferation occurs sympodially below the most recent conidiogenous locus. The conidiogenous loci are closely approximated in a regular fashion, not darkened and never protuberant. The degree of geniculation of the conidiophore and the prominence of the conidiogenous locus are determined by the precise location of the proliferating region of the conidiogenous cell wall. In *Sympodioplanus*, the youngest conidium is formed at the apex of the conidiogenous cell. Proliferation originates (immediately) adjacent (below and to one side) to this locus, thus there is little if any protrusion of the conidiogenous loci from the plane of the conidiogenous cell wall. Wall building seems to be concentrated on fast production of new structures rather than thickening of existing loci. A new conidium initial is subsequently formed on alternating sides of the conidiogenous cell apex. Geniculation of the conidiophore is mild. After conidium release a "scar" is barely perceptable. In sympodial genera where cell wall thickening occurs at the conidiogenous locus, conidiogenous cell proliferation occurs some distance from the previous locus where wall material is thinner. Thickened conidiogenous loci often protrude in varying degrees from the plane of the conidiophore wall. In these cases a prominent scar is seen after conidium release as in *Pseudospiropes* (Ellis 1971).

Many morphologically similar specimens of sympodially proliferating anamorphic microfungi are being discovered and it is becoming increasingly difficult to find means to distinguish them. The catenation of conidia in the genera *Polyscytalum* (Riess 1853), *Sympodiella* (Kendrick 1958) and *Parasympodiella* (Ponnappa 1975) distinguishes these genera from the other sympodial genera. *Sympodioplanus* has solitary conidia. *Cylindrosympodium* (Castañeda Ruiz & Kendrick 1990) and *Solosympodiella* (Matsushima 1971) are also distinguished by their solitary conidia. The conidiogenous loci of *Cylindrosympodium* are "flat-topped denticles" and in this way differ markedly from *Sympodioplanus*. The characteristics of the conidiogenous locus in the stromatic genus *Thedgonia* B. Sutton (flat, wide and unthickened) are similarly used to differentiate this genus from *Cercospora* Fresen. and other related genera which have thickened scars (Sutton 1973b). The distinction between *Sympodioplanus* and *Solosympodiella* will be discussed at length further on.

The genus *Subulispora* is named with respect to the "awl-shaped" apex of the conidium easily recognized in the type species, *Sub. procurvata* Tubaki & Yokoyama, and in *Sub. rectilineata* Tubaki & Yokoyama (Tubaki & Yokoyama 1971), *Sub. elegantissima* P.M. Kirk (Kirk 1985), *Sub. argentina* Arambarri & Mengascini (Arambarri et al. 1987), *Sub. longirostrata* Nawawi & Kuthubutheen (Nawawi & Kuthubutheen 1987) and *Sub. malaysiana* (Nawawi & Kuthubutheen 1990). Conidium shape is not generally used as a morphological characteristic to delimit genera, although conidium shape is certainly an integral part of the ontogenetic process. Using the characteristics of conidium shape in the etymology of the genus name, however does emphasize such a feature and in this case creates a conflict. *Sub. britannica* Sutton (Sutton 1973b), *Sub. africana* (Morgan-Jones, Sinclair & Eicker) P.M. Kirk, *Sub. cylindrospora* P.M. Kirk (Kirk 1985), *Sub. gracilis* (Matsush.) De Hoog (De Hoog 1985), *Sub. hareae* Sutton (Sutton 1978), *Sub. minima* Kirk (Kirk 1981), and *Sub. variabilis* De Hoog (De Hoog 1985) have all been described with irreverence to the generic etymology. The conidia of these seven species are mostly cylindrical with a rounded or obtuse apex and only in *Sub. britannica* are they referred to as "attenuate towards the apex". In *Sub. gracilis* conidia are "narrowed towards the rounded apex". *Sub. minima* was assigned to *Subulispora* "with reservations" by Kirk (Kirk 1981) as its predominant characteristics are monoblastic sympodial conidiogenesis and solitary conidia, yet the conidium shape is distinctly cylindrical and not subulate or even attenuate at the apex.

Nawawi & Kuthubutheen (1990) erroneously state that *Sub. malaysiana* departs from the generic concept of *Subulispora* because "the conidia are borne on raised rather than flat scars". *Sub. procurvata*, the type, is depicted as having protuberant conidiogenous loci. *Sub. gracilis* and *Sub. minima* are described as having denticles. Except *Sub. africana* (Morgan-Jones et al. 1983) and *Sub. cylindrospora* (Kirk 1985), all the other current members of *Subulispora* have moderate to distinctly protuberant conidiogenous loci. In these two taxa, the conidiogenous loci are not raised above the plane of the conidiogenous cell wall. The conidiophores are, however, distinctly geniculate (at least 45 to 90 degrees in some instances), making them very distinct from *Sympodioplanus*. The conidiogenous loci of *Sympodioplanus* are closely approximated, although in a regular fashion, not darkened, and are never protuberant. With respect to conidium characteristics, one can rarely find a slightly attenuate apex. These rare conidia also have a greater number of septa (Plate 1, Fig. 6c) These characteristics distinguish them as somewhat abnormal. It is important to note that, among the species of *Subulispora* that have conidia with a narrowed apex (*Sub. procurvata, Sub. rectilineata, Sub. elegantissima, Sub. argentina, Sub. longirostrata* and *Sub. malaysiana*), the conidiogenous loci are all closely and irregularly clustered and are protuberant. These species form a distinct group within the genus *Subulispora*. It awaits further studies to clarify the true relationships.

The conidiogenous loci in *Catenosubulispora* (Matsushima 1971) are similar to *Subulispora* in shape and arrangement and the conidia are subulate with a long, filiform, attenuate apex. The conidia can bear additional conidiogenous loci both laterally and at their apex. This is not seen in any *Subulispora* species. The conidiogenous scars are also darkened in *Catenosubulispora*.

Solosympodiella is a genus considered as possibly congeneric with *Subulispora* (De Hoog 1985). It was established by Matsushima to accommodate species with sympodially proliferating conidiophores with "wide, flat conidiogenous scars and solitary conidia which are elliptical to clavate with truncate bases" (Matsushima 1971). That the term "flat" is used to describe the nature of the scar itself and not its relation to the plane of the conidiogenous cell wall, is clear when one looks at the descriptions and recordings of the species thus far described. Of all species of *Solosympodiella*, namely *Sol. clavata* Matsush. (Matsushima 1971), *Sol. cylindrospora* Matsush., *Sol. pseudoseptata* Matsush., *Sol. rigidentata* Matsush. (Matsushima 1975), *Sol. palmicola* Matsush. (Matsushima 1980), *Sol. phyllostachidis* Matsush. (Matsushima 1983), *Sol. queenslandica* Matsush. (Matsushima 1989), and *Sol. inaequiseptata* Matsush. (Matsushima 1993), only *Sol. phyllostachidis* has conidiogenous scars that are not raised above the plane of the conidiogenous cell wall. Matsushima (1989) comments that the type, *Sol. clavata,* is "manifestly denticulate". The conidia of *Sol. phyllostachidis* are cylindrical, attenuate towards the apices with truncate bases and in this respect resemble many of the species classified in *Subulispora.* Both *Solosympodiella* and *Subulispora* are found on decaying leaves, whereas *Sympodioplanus* is found on dead wood. The disposition of *Sol. phyllostachidis* should be reconsidered but only after further investigations have taken place.

Pseudospiropes (Ellis 1971) has expanded from two wood-inhabiting species to a genus including twenty-seven very heterogeneous taxa. (Castañeda Ruiz 1987, 1988; De Hoog & von Arx 1973; Deighton 1985; Ellis 1971, 1976; Holubová-Jechová 1973; Holubová-Jechová & Mercado Sierra 1986; Hughes 1989; Iturriaga & Korf 1990;

Matsushima 1975, 1987, 1989; Morgan-Jones 1977, 1982; Rai & Rai 1995; Sharma 1980; Sivanesan & Sutton 1985; Sutton 1973a, 1993). Among the taxa, *P. obscurus* Matsush. has been described as having "obscure" conidiogenous scars which are neither pigmented nor protuberant (Matsushima 1983). Although this species also occurs on decaying wood, the nature of the conidiogenous loci which are markedly constricted with respect to the basal region of the conidium, raises doubts about its proper placement in *Pseudospiropes*. Iturriaga and Korf (1990), monographed the Discomycete genus *Strossmayeria* Schulzer and proved the genetic associations of the *Pseudospiropes* anamorphs they cultured. Of the fifteen *Pseudospiropes* anamorphs found, the identification of only three species was verified, namely *P. nodosus* (Wallr.) M.B. Ellis, an anamorph of *S. atriseda* (Saut.) Iturriaga, *P. simplex* (Kunze ex Pers.) M.B. Ellis, an anamorph of *S. basitricha* (Sacc.) Dennis and *P. josserandii* (Bertault) Iturriaga, an anamorph of *S. josserandii* (Grelet) Bertault. The *Pseudospiropes* among which *Sym. capensis* was growing is most similar to the anamorph described, yet unnamed by Iturriaga and Korf (1990) for *S. immarginata* (Pat. & Gaill.) Iturriaga. The relationship of this *Pseudospiropes* with *Sym. capensis* is only speculative and beyond the scope of this paper. The anamorphs of *Strossmayeria* have conidiogenous scars that are always darkened and protuberant (however more so in the "*P. nodosus* type" and less so in the "*P. simplex* type"). The conidia are markedly similar in size, shape (being mostly fusiform), and septation (being pseudoseptate). The conidial wall is multi-layered and the surface is always pitted or "poroid" (Iturriaga & Israel 1985). It has been postulated that the generic name *Pseudospiropes* should be reserved for those species with a *Strossmayeria* teleomorph (Iturriaga & Korf 1990).

Percurrent proliferation occurs in some sympodial species. Percurrent proliferation is a recognized feature of *Pseudospiropes* (Iturriaga & Korf 1990). In *P. nodosus* there is a break in a thickened apical area of the conidiogenous cell wall through which proliferative growth occurs. In *Subulispora* it is only described for *Sub. minima* where new growth appears to "slide" through the terminal portion of the conidiogenous cell where no apparent thickening has occurred. It is questionable whether or not this is a genus delimiting characteristic.

In *Chikaneea* (Sutton 1973a), a monospecific genus, conidia are similar to those of *Sym. capensis*. The differentiation of the genera is demonstrated in Table 1.

Table 1. Differentiation of *Chikaneea* and *Sympodioplanus*.

Characteristic	*Chikaneea*	*Sympodioplanus*
Sympodial proliferation	present	present
Conidiogenous scar	unthickened	unthickened
Conidiophore coloration	hyaline	brown
Conidiogenous loci morphology	broadly denticulate	flat, not protuberant
Number of conidiogenous loci	three or less	numerous
Catenation of conidia	sometimes	never

Table 2 utilizes two characteristics to simplify the distinguishing of *Sympodioplanus* from the other nine genera discussed in this paper.

Table 2. Summary of two main features aiding the diagnosis of *Sympodioplanus*.

GENUS	CATENATION OF CONIDIA	PROTUBERANT CONIDIOGENOUS LOCI
CATENOSUBULISPORA	YES	YES
CHIKANEEA	YES OR NO	YES
PARASYMPODIELLA	YES	NO
POLYSCYTALUM	YES	YES
SYMPODIELLA	YES	NO
CYLINDROSYMPODIUM	NO	YES
PSEUDOSPIROPES	NO	YES
SOLOSYMPODIELLA	NO	YES
SUBULISPORA	NO	YES
SYMPODIOPLANUS	NO	NO

Single characteristics may never be unequivocably significant at the generic level. It is therefore necessary to create combinations of characteristics, hopefully as simplified as possible, to define the genera. These characteristics may be significant at various taxonomic levels. Their usefulness is in differentiation of the taxa. Problems have arisen when a morphological characteristic was used to define the taxonomic level of a species ie. *Subulispora* (vide supra). The similarity of the morphological characteristics of the anamorphs of *Strossmayeria* isolated by Iturriaga and Korf (1990) suggests there is a very narrow range of variation within the genus *Pseudospiropes.* The genus definition is therefore very restricted. It is thus imperative that descriptions of new taxa are as thorough as possible so as not to overlook any potential key characteristics that may indicate relatedness and so that one does not preclude new taxa from achieving their proper rank by sequestering particular characteristics as having significance at specific taxonomic levels. These characteristics are used to facilitate diagnoses only. When gene codes that regulate the morphological expressions in anamorphic fungi are identified and their distributions analyzed, only then will the correlations between specific characteristics and relatedness be more clearly defined.

Acknowledgements

Financial support from the Foundation for Research Development is acknowledged. We thank Mr. P. Hasse for reviewing the Latin diagnosis and Ms A. Baxter and Ms I.H. Rong of the National Mycological Herbarium of South Africa for reviewing the manuscript.

References

Arambarri, A., Cabello, M. & Mengascini, A. 1987. New hyphomycetes from Santiago River. II. (Buenos Aires Province, Argentina) *Mycotaxon* **30**: 263-267.

Castañeda Ruiz, R.F. 1987. Fungi Cubenses II. La Habana, Cuba: Instituto de Investigaciones Fundamentales en Agricultura Tropical "Alejandro de Humboldt".

Castañeda Ruiz, R.F. 1988. Fungi Cubenses III. La Habana, Cuba: Instituto de Investigaciones Fundamentales en Agricultura Tropical "Alejandro de Humboldt".

Castañeda Ruiz, R.F. & Kendrick, W.B. 1990. Conidial fungi from Cuba. I. University of Waterloo Biology Series **32**: 1-53.

De Hoog, G.S. 1985. Taxonomy of the *Dactylaria* Complex, IV. *Dactylaria, Neta, Subulispora* and *Scolecobasidium*. *Studies in Mycology*. **No. 26**, 124 pp.

De Hoog, G.S. & Von Arx, J.A. 1973. Revision of *Scolecobasidium* and *Pleurophragmium*. *Kavaka* **1**: 55-60.

Deighton, F.C. 1985. Three leaf-spotting Hyphomycetes on palms. *Trans. Br. Mycol. Soc*. **85**(4): 739-742.

Ellis, M.B. 1971. Dematiaceous Hyphomycetes. Commonwealth Mycological Institute, Kew, England.

Ellis, M.B. 1976. More dematiaceous Hyphomycetes. Commonwealth Mycological Institute, Kew, England.

Holubová-Jechová, V. 1973. Lignicolous Hyphomycetes from the Netherlands. *Proc. K. Ned. Akad. Wet., Ser. C*. **76**(3): 297-302.

Holubová-Jechová, V. & Mercado Sierra, A. 1986. Studies on Hyphomycetes from Cuba IV. Dematiaceous Hyphomycetes from the province Pinar del Rio. *Ceská Mykol*. **40**: 142-164.

Hughes, S.J. 1989. New Zealand Fungi, 33. Some new species and new records of dematiaceous Hyphomycetes. *N. Zeal. J. Bot.* **27**(3): 449-459.

Iturriaga, T. & Israel, H.W. 1985. Studies in the genus *Strossmayeria* (*Helotiales*). 5. Conidia and conidiogenesis in *Pseudospiropes*: a light and electron microscope investigation. *Can. J. Bot.* **63**: 195-200.

Iturriaga, T. & Korf, R.P. 1990. A monograph of the Discomycete genus *Strossmayeria (Leotiaceae),* with comments on its anamorph, *Pseudospiropes (Dematiaceae)*. *Mycotaxon* **36**(2): 383-454.

Kendrick, W.B. 1958. *Sympodiella*, a new Hyphomycete genus. *Trans. Br. Mycol. Soc.* **41**: 519-521.

Kirk, P.M. 1981. New or interesting microfungi. III. A preliminary account of microfungi colonizing *Laurus nobilis* leaf litter. *Trans. Br. Mycol. Soc*. **77**(3): 457-473.

Kirk, P.M. 1985. New or interesting microfungi XIV. Dematiaceous Hyphomycetes from Mt. Kenya. *Mycotaxon* **23**: 305-352.

Matsushima, T. 1971. Microfungi of the Solomon Islands and Papua-New Guinea. Publ. by the author. Kobe, Japan.

Matsushima, T. 1975. Icones microfungorum a Matsushima lectorum. Publ. by the author. Kobe, Japan.

Matsushima, T. 1980. Saphrophytic microfungi from Taiwan, Part 1. Hyphomycetes. *Matsushima Mycological Memoirs*. **No. 1.** Publ. by the author. Kobe, Japan.

Matsushima, T. 1983. *Matsushima Mycological Memoirs.* **No. 3**. Publ. by the author. Kobe, Japan.

Matsushima, T. 1987. *Matsushima Mycological Memoirs.* **No. 5**. Publ. by the author. Kobe, Japan.

Matsushima, T. 1989. *Matsushima Mycological Memoirs.* **No. 6.** Publ. by the author. Kobe, Japan.

Matsushima, T. 1993. *Matsushima Mycological Memoirs.* **No. 7.** Publ. by the author. Kobe, Japan.

Morgan-Jones, G. 1977. Notes on Hyphomycetes. XVII. A new species of *Pseudospiropes*. *Mycotaxon* **5**(2): 481-483.

Morgan-Jones, G. 1982. Notes on Hyphomycetes. XLII. New species of *Acrodictys* and *Pseudospiropes* from South Africa. *Mycotaxon* **16**: 87-191.

Morgan-Jones, G., Sinclair, R.C. & Eicker, A. 1983. Notes on Hyphomycetes. XLIV. New and rare dematiaceous species from the Transvaal. *Mycotaxon* **17**: 301-316.

Nawawi, A. & Kuthubutheen, A.J. 1987. A new species of the genus *Subulispora*. *Mycotaxon* **30**: 459-463.

Nawawi, A. & Kuthubutheen A.J. 1990. Addition to *Subulispora* from Malaysia. *Mycotaxon* **37**(1): 389-393.

Ponnappa, K.M. 1975. *Parasympodiella* gen.nov. *Trans. Br. Mycol. Soc.* **64**(2): 344-345.

Rai, A.N. & Rai, B. 1995. Two new Hyphomycetes from India. *Mycol. Res*. **99**(8): 1004-1008.

Riess, H. 1853. Beiträge zur Pilzkunde. *Bot. Zeit.* **11:** 129-140.

Sharma, N.D. 1980. Some additions to Fungi of India - VIII. *J. Indian Bot. Soc.* **59**: 72-77.

Sivanesan, A. & Sutton, B.C. 1985. Microfungi on *Xanthorrhoea*. *Trans. Br. Mycol. Soc*. **85**(2): 239-255.

Sutton, B.C. 1973a. Hyphomycetes from Manitoba and Saskatchewan. Canada. *Mycol. Pap*. **132**: 1-134.

Sutton, B.C. 1973b. Some Hyphomycetes with holoblastic sympodial condiogenous cells. *Trans. Br. Mycol. Soc.* **61**(3): 417-429.

Sutton, B.C. 1978. Three new Hyphomycetes from Britain. *Trans. Br. Mycol. Soc.* **71**(1): 167-171.

Sutton, B.C. 1993. Mitosporic fungi from Malawi. *Mycol. Pap*. **167**: 1-78.

Tubaki, K. & Yokoyama, T. 1971. Notes on the Japanese Hyphomycetes V. *Trans. Mycol. Soc. Japan* **12**: 18-28.

MYCOTAXON

Volume LXIV, pp. 375-383 September 1997

FUNGI OF BARRO COLORADO ISLAND, ADJACENT PANAMA, AND THE CALI REGION OF COLOMBIA

R.D. Goos
Department of Biological Sciences
University of Rhode Island
10 Ranger Road
Kingston, RI 02881-0816
USA

Abstract

This paper deals with eleven species of mitosporic fungi collected from Barro Colorado Island, adjacent Panama, and the vicinity of Cali, Colombia. The following represent apparent new records for the American tropics: *Fusariella concinna, Cladobotryum sphaerocephalum, Podosporium nilgirense, Stachybotrys parvispora.*

Key Words: mitosporic fungi, Central America, Barro Colorado Island.

Introduction

This report is a continuation of a study on Central and South American fungi began in the summer of 1973. A summary of field aspects of the project (Goos, 1974) as well as a report on some Hyphomycetes from Barro Colorado Island (BCI) (Goos and Pirozynski, 1973) have been published previously. This report treats additional mitosporic species from BCI, including one specimen collected in adjacent Panama, as well as three species collected in the vicinity of Cali, Colombia. All material collected on this expedition, including specimens cited in this report and the field records for the project, have been deposited in the New York Botanical Garden Herbarium (NY).

Knowledge of the mycota of Central and South America is still very much in a developmental state; indeed, much remains to be learned about the mycota of tropical regions throughout the world (Heredia et al., 1995). It is encouraging, therefore, to see an increasing number of recent reports from mycologists resident in these areas (Heredia, 1994; Heredia et al., 1995; Mercado et al., 1995), as the resident mycologist has a greater opportunity to build a sound inventory of species for a region than does the visiting specialist (Goos, 1978).

Description of Species

1. *Cladobotryum sphaerocephalum* (Berk.) Rogerson et Samuels. Mycologia 85:241. 1993. (Anamorph of *Hypomyces albidus* Rehm.)

In culture at 25 C on CMYD (Difco corn meal agar, 0.01% yeast extract, 0.02% dextrose), the *colony* is fast growing, reaching a diameter of 5.5 cm in 10 days, floccose, white with a wine-colored reverse. *Mycelium* composed of septate, hyaline hyphae, 2-5 μm in diam. *Conidiophores* branched, only slightly differentiated from hyphae. *Conidiogenous cells* phialides, up to 30 μm in length by 3 μm diam at the base. Conidia hyaline, 4 celled, elliptical, sometimes somewhat curved, rounded at the apex, attenuated and pointed at the curved, rounded at the apex, attenuated and pointed at the base, 18-24 x 6-7 μm in size.

Rogerson and Samuels (1993) discussed this species as one that occurs on polyporaceous fungi. While mycelium of a basidiomycete can be seen on the specimen from which the culture was isolated, fruiting bodies are not present, so that the identity of the host cannot be determined. The culture was examined by Lynne Sigler and Walter Gams, both of whom concur that it is assignable to *C. sphaerocelphalum*. In addition to Rogerson and Samuels (1993), this species has been discussed by Lentz (1967), Gams and Hoozemans (1970), and DeHoog (1978). Rogerson and Samuels (1993) give its distribution as Austria and its host at *Stereum sanguinolentum*. Lentz's report was based on a collection from New Jersey.

Specimen examined: Barro Colorado Island. In culture from decaying palm petiole, Zetek Trail. 6 July, 1973. R.D. Goos, Culture and specimen No. BCI-0032. ATCC No. 200723; UAMH (University of Alberta Microfungus Collection) No. 8555; CBS (Centraalbureau voor Schimmelcultures) No. 920.96.

2. *Fusariella concinna* (Sydow) Hughes. CMI Mycological Paper No. 28:7-8. 1949.
Figs. 1-3

Colonies on CMYD reaching 4 cm diam after 14 days at 25 C; zonate when incubated under 12/12 light/dark cycle. *Mycelium* white, cottony, composed of septate hyaline hyphae, 2-3 μm diam. Sporulating areas moist, blackish-green, conidiophores aggregating in age and approaching sporodochia or synnemata in appearance. *Conidiophores* little differentiated from the mycelium, sparingly branched, terminating in slender phialides up to 45 μm in length x 3 μm diam at the base. *Conidia* 3 septate at maturity, rather thick-walled, ellipsoid to obclavate in form, widest near the base, 19-24 x 4-6 μm.

Hughes (1949) reviewed the genus *Fusariella*, providing descriptions and illustrations. This culture agrees with his description of *F. concinna*, except that the conidia are slightly broader than those found in the type specimen. In culture, they range up to 6μm in width, whereas Hughes gave the maximum width as 4.5 μm. A tendency toward synnemata formation was seen in culture. Other morphological aspects appear consistent with Hughes' description of *F. concinna*.

The type of the species was collected in India in 1930. Ellis (1971) gave its current distribution as known only from India. It is listed (No. 31665) in the Institute for Fermentation (IFO) List of Cultures (1996) from Japan, as an isolate obtained from a decayed leaf. The BCI isolation extends its known distribution to the western hemisphere. As far as I have been able to determine, these three records represent the present known distribution of the fungus. Three such disjunct records suggest that it is probably world-wide in distribution although possibly limited to tropical or sub-tropical habitats.

Specimen examined: Barro Colorado Island. In culture from dead leaf, Zetek Trail. 6 July, 1973. R.D. Goos. Culture and specimen No. BCI-0027. (ATCC No. 200788).

3. ***Graphium penicilloides*** Corda. Icon. Fug., 1:18. 1837.

Colonies on CMYD dark, zonate under 12/12 light cycle, producing synnemata throughout, except at colony margins. *Mycelium* hyaline to dark brown, composed of branched, septate hyphae, 1-2 μm in diam, bearing conidia in moist heads at the apex. *Conidiogenous cells* monoblastic annellides. *Conidia* pale brown to hyaline, ovoid to elliptical, rounded at the apex, truncate at base, 5-6 x 3-4 μm. *Chlamydospores* abundant, thick-walled, dark brown, 5-6 μm in diameter.

This fungus agrees closely with the description given by Ellis (1971) for this species, although Ellis does not mention chlamydospores. They are abundant in this culture, however. Ellis gives the distribution of this species as Europe and North America.

Specimen examined: Barro Colorado Island. In culture from decaying breadfruit leaf, dormitory area. 12 July, 1973. R. Goos, 0126. (ATCC No. 200765)

4. ***Harpographium fasiculatum*** Saccardo. Michelia, 2:33. 1880.

Colonies effuse, dark brown; synnemata conspicuous. *Mycelium* immersed. *Conidiophores* macronematous, synnematous, individual hyphae tightly adpressed, up to 4 μm in diam. septate, brown. Synnemata simple or branched, up to 700 μm in length, and 40-50 μm wide at the base, often narrowing and splaying out at the apex, or sometimes the apex is enlarged. *Conidiogenous cells* polyphialidic, 10-12 x 3-4 μm, occurring along the sides and apex of the synnemata. *Conidia* acicular, falcate or curved, non-sepate, 12-15 x 1-2 μm.

The taxonomy of this species was reviewed by Morris (1962), and the fungus illustrated (Morris, 1962, 1963). Ellis (1971) also provided a description and illustration. According to these authors, the fungus is widely distributed, having been found in Europe, North America and India on a wide range of plant material.

Specimen examined: Barro Colorado Island. On dead bamboo branch, near dormitory. 12 July, 1973. R. Goos, No. 0121.

5. ***Helicomyces roseus*** Link

Colonies effuse, white. *Mycelium* scant, mostly immersed, composed of branched, brown, closely septate (avg. 10-12 μm between septa) hyphae, 5-6 μm in diam. with frequent anastomoses. *Setae* lacking. *Stalked sclerotia* (sclerotes pedicelees) often present, sclerotia up to 40 μm in diam. *Conidiogenous cells* borne directly on the mycelium or at the terminus of branches, mostly monoblastic. *Conidia* attached eccentrically, hyaline, coiled up to 3.5 times, 25-35 μm in diam. *Conidial filament* 3 to 3.5 μm in diam., multiseptate.

Although the material on the specimen is scant, it is possible to assign the fungus to *Helicomyces roseus* on the basis of presence of the "sclerotes pedicelees", conidium size, eccentric attachment of the conidia, and the nature of the conidiogenous cells. The mitosporic fungus is associated with the ascomata of a nectriaceous fungus, but it is impossible with non-living material to determine whether or not they are related.

Helicomyces roseus is common on decaying vegetation in tropical areas and is world-wide in distribution (Goos, 1985).

Specimen examined: Colombia. On palm petiole, near Buenaventura, 25 July, 1973. R.D. Goos 0236.

6. ***Myrothecium roridum*** Tode ex Fries. Syst. mycol. 3:217. 1829.

Colonies on CMYD agar white, becoming green to black in the sporulating areas. *Mycelium* composed of septate, hyaline hyphae, 3-5 μm in diam. Chlamydospore-like cells seen in older cultures, often in chains. *Sporodochia* borne directly on the mycelium, often becoming confluent, moist, dark green to almost black. *Conidiogenous cells* phialides. *Conidia* cylindrical, pale green by transmitted light, 6-8 x 1.5-2 μm in size.

Ellis (1971) list this fungus as cosmopolitan and very common on a wide range of substrates.

SEE ERRATA

Specimen examined: Barro Colorado Island. In culture from decaying bamboo, associated with *Arthrinium* sp. Collected near dormitory area, 12 July 1973. R.D. Goos culture and specimen No. BCI-0115. (ATCC No. 200789)

7. ***Phaeoisaria clematidis*** (Fuckel) Hughes. Can. J. Bot. 36:795. 1958.

Colonies effuse, dark, bearing numerous synnemata that are often bent and entangled. *Mycelium* dark, mostly immersed. *Synnemata* dark, becoming gray to whitish in the apical, sporulating region, exceeding 2000 μm in length and up to 60 or more μm in diameter at the base, the base expanding to form a supporting disc. *Conidiogenous cells* proliferating, producing conidia on short denticles formed from successively produced growing points. *Conidia* hyaline, ovate, slightly broader at the apex, 6-10 x 3-5 μm in size.

The conidia of this specimen are somewhat larger (6-10 x 3.5) than the dimensions given by Hughes (1978) and Ellis (1971), but fall within the range given by DeHoog and Papendorf (1976), whose study was based on cultures. Other features of this collection are consistent with the descriptions of *P. clematidis*.

Ellis (1976) considers this fungus common and widespread. Observations by DeHoog and Papendorf (1976) support this view.

Specimen examined: Barro Colorado Island. On decaying bamboo stem, near dormitory. 12 July, 1973. R. Goos, No. 0120.

8. ***Podosporium nilgirense*** (Subram.) Ellis. More Dematiaceous Hyphomycetes. 1976. Figs. 5-7.

Colonies effuse, dark, bearing numerous synnemata. *Mycelium* superficial and immersed. *Synnemata* dark, up to 1200 μm in length, expanding into a fertile area near the apex. *Conidiogenous cells* monotretic. *Conidia* solitary, mid to dark brown, fusiform to obclavate, the apical cell sometimes extended, the basal cell showing a distinct pore scar, 4 to 8 septate, 32-65 long x 8-10 μm in width.

This appears to be the first report of this fungus outside of India (Ellis, 1976).

Specimens examined: Barro Colorado Island. On decaying bamboo stem, near laboratory. 11 July, 1973. R.D. Goos. No. 0109. Panama: Cerro Campana. On decaying bamboo stem. elevation ca. 950 m. 18 July, 1973. R.D. Goos. No. 0183.

9. ***Sporidesmium nodipes*** (Penz. & Saccardo) Hughes. Can. J. Bot. 36:809. 1958. Fig. 4.

Colonies hairy, black, broadly effuse, bearing hyphae and conidiophores in tufts.

Mycelium mostly superficial. *Conidiophores* dark to brown, percurrent, with 6-8 proliferations being common, up to 250 µm in diam. *Conidia* borne terminally, multiseptate, rounded at the apex and truncate at the base, mid to dark brown, basal cell subhyaline, 42-60 x 7-9 µm.

This fungus has been previously reported from Gabon, Indonesia (Java) and Venezuela (Ellis, 1976).

Specimen examined: Barro Colorado Island. On decaying palm rachis, Zetek Trail, 6 July, 1973. R.D. Goos, No. 0046.

10. ***Stachybotrys parvispora*** Hughes. CMI Mycological Papers 42:74-76. 1952.

Colonies effuse, evident as conidiophores bearing dark heads of conidia. *Mycelium* scant, immersed in substratum. *Conidiophores* hyaline, up to 170 µm in length, 4-6 µm in diam. at base, terminated by a whorl of phialides. *Phialides* 10-13 µm in length, 3-4 µm in diam. *Conidia* smooth, dark, non-septate, ellipsoidal, 5-8 x 3-4 µm.

Ellis (1971) gives the distribution of this fungus as Congo, Ghana, Malaya, Sierra Leone and the U.S.A.

Specimen examined: Colombia, near Saladito. In pith chamber of dead branch of *Cercropia* tree, 24 July, 1973. R.D. Goos. No. 0267.

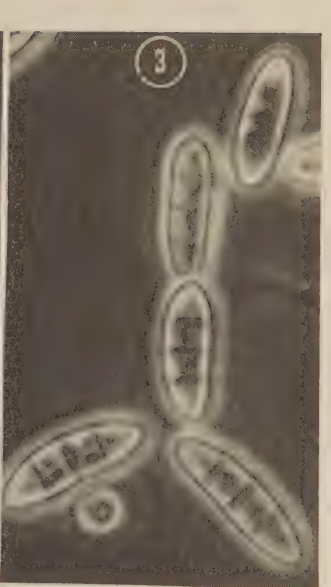
11. ***Tubercularia lateritia*** (Berk.) Seifert. (Anamorph of *Nectria pseudotrichia* Berk. & Curt.) A Monograph of *Stilbella* and some allied Hyphomycetes. CBS Studies in Mycology, No. 27, p. 118. 1985.

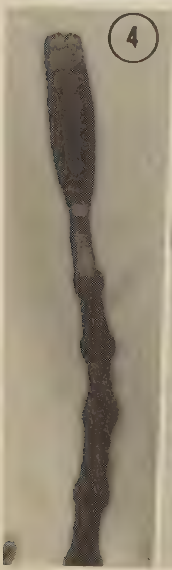
Colony effuse, consisting of synnemata erupting from the bark. *Mycelium* immersed in substratum *Synnemata* orange, up to 2000 µm in length, 250 µm in diam. at the base, composed of parallel hyphae, 3-4 µm in diam. Short hyphae (marginal hyphae) protrude from the synnemata; these cells are 15-20 µm in length, 3-4 µm in diam. *Conidiogenous cells* phialides. *Conidia* formed in mucoid masses, yellow when dry, hyaline, ovate, 6-8 x 2-3 µm.

Fungi of Barro Colorado Island. Figs. 1-3. *Fusariella concinna*. Fig. 1. Conidiophores aggregated to form a synnema. Fig. 2. Phialides and conidia. x1000. Fig. 3. Conidia. x1000. Fig. 4. *Sporidesmium nopides*. Conidiophore showing percurrent proliferation. Figs. 5-7. *Podosporium nilgirense*. Fig. 5. Apex of synnema showing conidiogenous cells. Fig. 6. Single conidiogenous cell showing pore. x2000. Fig. 7. Two conidia. x1000.

①

②


③


④

⑤

⑥

⑦

Seifert (1985) states that this fungus is widespread and is pantropical and subtropical in distribution. It has been found on a wide range of host plants, but a not to have been previously recorded on *Cercropia* (Seifert, 1985).

Specimen examined: Colombia. On dead twig of *Cercropia* in Forest Re north of Cali. 26 July, 1973. R.D. Goos. No. 0268.

Acknowledgments

I thank the American Philosophical Society of Philadelphia for a grant whic made the field aspects of this work possible. I especially thank the following colle who have assisted me with identifications, literature citations and other forms of encouragement: Lynne Sigler and Walter Gams for their help in identifying *Cladobotryum sphaerocephalum*; Keith Seifert for providing the identification of *Tubercularia lateritia.* A special word of appreciation goes to J.L. Crane for the presubmission review of the manuscript.

References

DeHoog, G.S. 1978. Notes on some fungicolous Hyphomycetes and their relatives. Persoonia 10: 33-81.

Ellis, M.B. 1971. Dematiaceous Hyphomycetes. Commonwealth Mycological Institute, Kew, Surrey, England. 608 p.

Ellis, M.B. 1976. More Dematiaceous Hyphomycetes. Commonwealth Mycologica Institute, Kew, Surrey, England. 507 p.

Gams, W. & A.C.M. Hoozemans. 1970. *Cladobotryum*-konidienformen von *Hypomyces*-Arten. Persoonia 6: 95-110.

Goos, R.D. 1974. Field studies of tropical Hyphomycetes. Amer. Philos. Soc. Year Book. 1974. pp. 344-345.

Goos, R.D. 1978. Comparative observations of the Hyphomycetes of Hawaii and Central America. Kavaka 6: 31-35.

Goos, R.D. 1985. A review of the anamorph genus *Helicomyces*. Mycologia 77: 606 618.

Goos, R.D. & K.A. Pirozynski. 1975. Fungi of Barro Colorado Island: new and interesting Hyphomycetes. Canad. J. Bot. 53: 2927-2932.

Heredia Abarca, G. 1994. Hifomicetes Dematiaceos en bosque mesofilo de montana. Registros neuvos para Mexico. Acta Botanica Mecicana 27: 15-32.

Heredia, G., Angel Mercado Sierra & Julio Mena Portales. 1995. Conidial fungi from leaf litter in a mesophilic cloud forest of Veracruz, Mexico. Mycotaxon 55: 473-490.

Hughes, S.J. 1949. Studies on Micro-fungi. I. The genus *Fusariella* Saccardo. CMI Mycol. Pap. 28;

Hughes, S.J. 1978. New Zealand Fungi. 25. Miscellaneous species. N.Z. Jour. Bot. 16: 311-370.

Institute for Fermentation. 1996. List of Cultures. 10 Ed. Osaka. 690 P.

Lentz, P.J. 1967. Delineations of forest fungi. Mycopath. et Mycol. Appl. 32: 1-25.

Linder, D.H. 1929. A monograph of the helicosporous fungi. Annals Missouri Botanical Gard. 16: 227-338.

Mercado Sierra, Angel, Gabriella Heredia & Julio Mena Portales. 1995. New species of dematiaceous Hyphomycetes from Veracruz, Mexico. Mycotaxon 55: 491-499.

Morris, E.F. 1962. Some species of *Harpographium* Sacc. American Midland Naturalist 68: 319-324.

Morris, E.F. 1963. The Synnematous Genera of the Fungi Imperfecti. Western Illinois Univ. Ser. Biol. Sci. No. 3. 143 p. Macomb, Illinois.

Rogerson, C.T. & G.J. Samuels. 1993. Polyporicolous species of *Hypomyces*. Mycologia 85: 231-272.

Seifert, K.A. 1985. A monograph of *Stilbella* and some allied Hyphomycetes. Studies in Mycology No. 27. Centraalbureau voor Schimmelcultures. Baarn. 238 pp.

MYCOTAXON

Volume LXIV, pp. 385-392 September 1997

METATRICHIA HORRIDA (MYXOMYCETES), AN AFRICAN SPECIES IN THE BAJA CALIFORNIA PENINSULA (MEXICO)

G. Moreno, M. Lizárraga & C. Illana

Dpto. Biología Vegetal. Universidad de Alcalá. 28871 Alcalá de Henares.
Madrid. Spain.

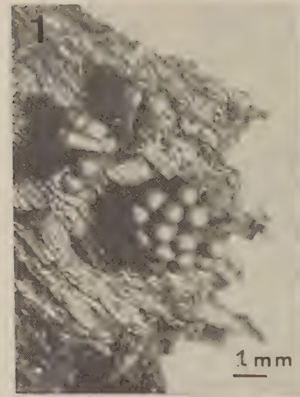
Abstract: An african species *Metatrichia horrida* is reported from Baja California Sur, Mexico. A detailed description, including characteristics, as well as SEM-micrographs, is given for this species new for the American continent.

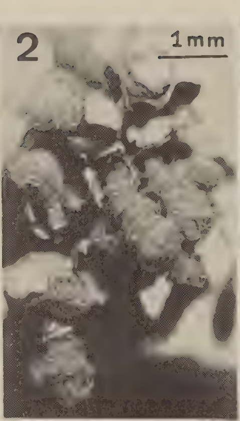
Keys words: *Metatrichia horrida, M. vesparium*, Myxomycetes, scanning electron microscopy, taxonomy, Mexico.

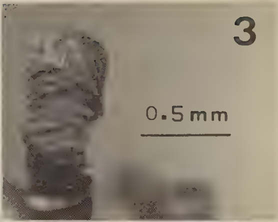
The Myxomycetes of Baja California, as of yet have been poorly researched. In two previous papers, we have reported on our studies of slime molds in the state of Baja California Norte (Lizárraga & al., 1996; 1997). In this current presentation, however, we introduce our first findings for the first study of these organisms in Baja California Sur: *Metatrichia horrida*. This present description of *M. horrida* is therefore the first report of this species for the American continent.

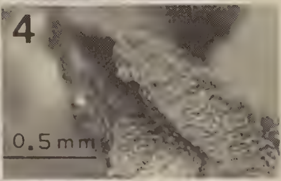
The samples were collected in a locality situated in the Cape region (Tropic of Cancer), of the Sierra de la Laguna, limited by the northern cities of Cabo San Lucas and San José del Cabo, which belong to the *Sanlucan* biogeographical province. The Sierra de la Laguna consists of granitic soils with thermotropical deciduous forests *Bursero microphyllae-Cyrtocarpetum edulis* (Peinado et al., 1995).

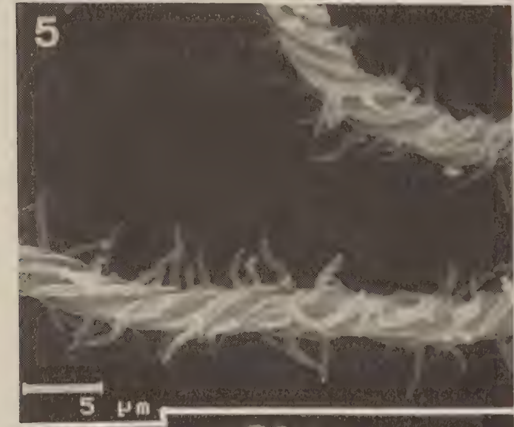
The specimens are deposited in the Herbarium of the Departamento de Biología Vegetal, Universidad de Alcalá de Henares (AH), Spain. A duplicate will be sent to BPI and MA.

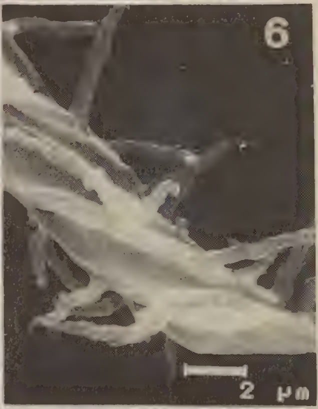

1
1 mm

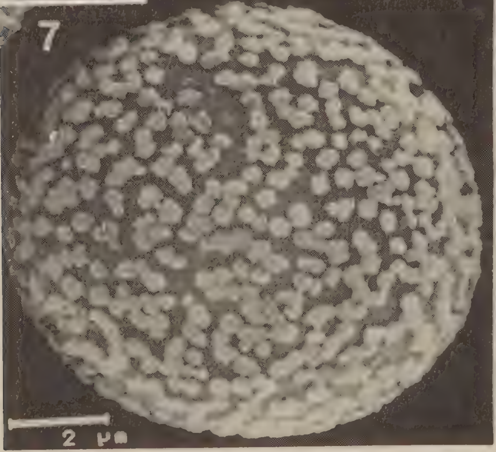

2
1 mm

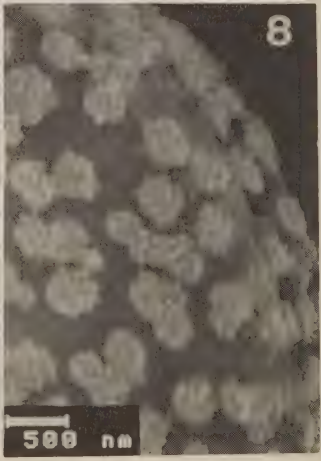

3
0.5 mm


4
0.5 mm


5
5 μm


6
2 μm


7
2 μm


8
500 nm

Metatrichia horrida **Ing,** ***Trans. Brit. Mycol. Soc.*** **47: 51. 1964. Figs. 1-8.**

Collections examined: ***Metatrichia horrida.*** MEXICO. San Felipe, Sierra de la Laguna, Baja California Sur, growing on decaying wood, 29.I.1996, *leg.* M. Lizárraga, G. Moreno & C. Illana, AH 20036, 20062, 20063, 20087, 20105, 20123, 20140 and 20289. ***M. vesparium.*** SPAIN: Mountain pass of Velate, Navarra, on wood of *Fagus sylvatica*, 9.X.1983, *leg.* G. Moreno & J. L. Manjón, AH 13253.

Sporangia densely aggregated, clustered in extensive groups (up to 35 sporangia), and often united into pseudoethalia, 0.4-0.5 mm diam. and 1-2.5 mm tall, subcylindrical, not angled by pressure, with the apex convex, sessile or stipitate; stalk erect, faintly striate, up to 1 mm tall, solitary or supporting clusters of sporangia, dark red; hypothallus extensive, dark red; peridium two-layered, the outer layer cartilaginous, thick, red-brown with metallic reflections, the inner layer membranous, thin, ochraceous; dehiscence by a preformed convex lid along which the sporangium opens; capillitium and spores orange in mass, by transmitted light red-ochraceous, capillitium of few, very long threads, unbranched, arranged spirally and completely filling the sporangia, 4-6 µm diam., the tips pointed, ornamented with 2-3 spiral bands and numerous spines, (2)3-5(6) µm long; spores (8)9-10 µm diam., globose, minutely spinose; the capillitium ornamentation as seen by SEM shows 2-3 strongly differentiated spiral bands with numerous, long spines, the spore wall ornamented with pila, irregularly distributed, somewhat verrucose in the top; plasmodium unknown.

The original description of Ing (1964) describes the general appearance as: "sporangia sessile, turbinate, densely aggregated and angled by pressure of *Metatrichia horrida* surrounding sporangia". Rammeloo (1981) describes his collections as: "sessiles au à stipe rudimentaire, commun à plusierus sporocystes, formé par un prolongement de l' hypothalle" whilst Härkonen & Saarimäki (1991) observed "sporangia densely aggregate, sessile, cylindrical". However, having made eight collections, we are able to provide a more detailed description, observing the variability in the morphological characters. In conclusion, *Metatrichia horrida* is a stipitate species that could have either a sessile form or a short stalk. The previous records indicated sessile forms which were extreme instances of mainly stipitate forms.

In the following table, the African and American collections of *Metatrichia horrida* are compared, setting out their most significant differences:

Figs. 1-8. ***Metatrichia horrida*** **(AH 20063).** Fig. 1. Group of sporangia. Figs. 2-4. Sporangia showing dehiscence by a preformed lid, the capillitium threads are arranged spirally within the cavity of the sporocarp. Figs. 5, 6. Capillitium with spiral bands and large spines, SEM. Fig. 7. Spore ornamentation, SEM. Fig. 8. Spore ornamentation with pila showing verrucose apex, SEM.

	Habit of sporangia	Stalk
ING (1964)	densely aggregated and angled by pressure of surrounding sporangia, a large development 10x3 cm	sporangia sessile
MARTIN & ALEXOPOULOS (1969) **(based mostly on the original description, but modified)**	densely crowded, angular from pressure, firmly united into pseudoaethalia composed of usually 200 or more sporangial units	sporangia sessile
RAMMELOO (1981)	fructification composée d'un grand nombre de sporocystes groupés en plusieurs groupes denses (ou en petits groupes de 3-10 sporocystes)	sporocystes sessiles ou à stipe rudimentaire de 0.3-0.4-0.6 mm de haut commun à plusieurs sporocystes
RAMMELOO (1984) **(description based on the type material)**	fructification large, of numerous, densely crowded sporocysts, forming a crust	sporocysts sessile
HÄRKÖNEN & SAARIMÄKI (1991)	sporangia densely aggregate	sporangia sessile
MEXICO	sporangia densely aggregated , in a extensive groups (up to 35 sporangia), often united into pseudoethalia	sessile or stipitate; stalk up to 1 mm tall

Habit of capillitium	Spines of capillitium	Spores (diam.)
capillitium of up to four very long elastic elaters, completely filling the sporangium	2-4 µm (average 3.2 µm) long	9.5-11 µm (average 10.3 µm)
capillitium of very long free elaters, not rarely recurved with the halves coiling about each other	2-4 µm long	9.5-11 µm
capillitium formé d'un petit nombre d'élatères (au moins 4), très longues, non ramifiées, se tordant en hélice sur elles-mêmes lors de la préparation	3.5-6 µm long	8-8.3-9 µm
capillitium composed of a few, very long threads, arranged spirally within the cavity of sporocyst	2.9-3.76-5.3 x 0.2-0.57-0.9 µm	8.3-9.36-10.6 µm
capillitium coiled inside the sporangium like a ball of yarn	elaters about 6.5 µm width without spines, 13 µm when spines included	8-9.2-10 µm
capillitium of few, very long threads, unbranched, arranged spirally and completely filling the sporangia	(2)3-5(6) µm long	8-9 (10) µm

The genus *Metatrichia* was proposed by Ing to accommodate *Metatrichia horrida*. The concept of the genus was later expanded (Nannenga-Bremekamp, 1966, 1982; Lakhanpal & Mukerji, 1976; Rammeloo, 1984), when other species that belonged to the genus *Hemitrichia* and *Trichia* were included: *M. arundinariae* (Rammeloo) T.N. Lakh. & Mukerji, *M. floriformis* (Schwein.) Nann.-Bremek, *M. floripara* (Rammeloo) Rammeloo, *M. paragoga* (Farr) T.N. Lakh. & Mukerji, *M. rosea* (Flatau & Nann.-Bremek.) Nann.-Bremek. and *M. vesparium* (Batsch) Nann.-Bremek.

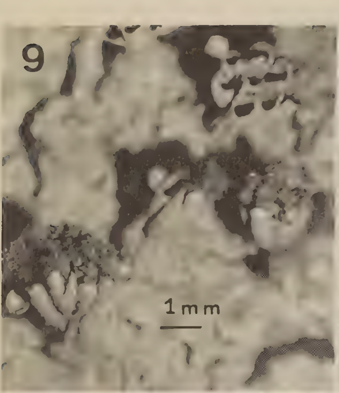
Metatrichia horrida differs from all these species by the elaters of the capillitium being ornamented with 3-4 spirals and numerous long spines (3-5 µm diam.). Likewise, these threads are spirally arranged within the sporangia, where they remain united and coiled in the form of a elastic spring, which forces open the operculum at time of maturity.

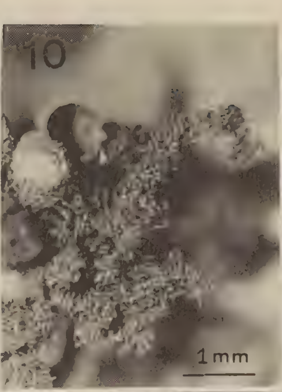
Metatrichia horrida is closely related to *M. vesparium*, because of the similarly stalked sporangia and related spore ornamentation. However, the threads of the capillitium of *M. vesparium* appear to be shorter and are ornamented with short spines (1-2 µm), whilst the elaters are free and not spirally arranged like a spring when they emerge on the dehiscence (Figs. 9-14).

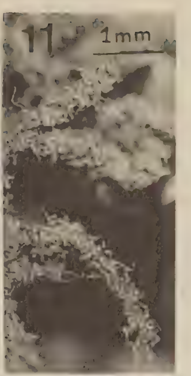
Metatrichia horrida was described by Ing based only on an abundant collection gathered from rotting wood, probably of *Euphorbia*, in Nigeria. A second collection was introduced by Almeida (1974) from Angola without specifying the substratum. Rammeloo (1981) made two new collections in Rwanda-Burundi, on mosses and fallen branches of *Acacia*. More recently Härkonen & Saarimäki (1991) harvested new samples in Tanzania on dead wood. We do not know of any further collections in other localities in Africa, hence we consider this first find in America to be worthy of reporting.

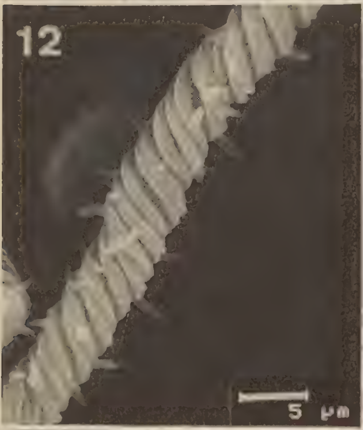
The SEM photographs included in this paper agree with those in Rammeloo (1984).

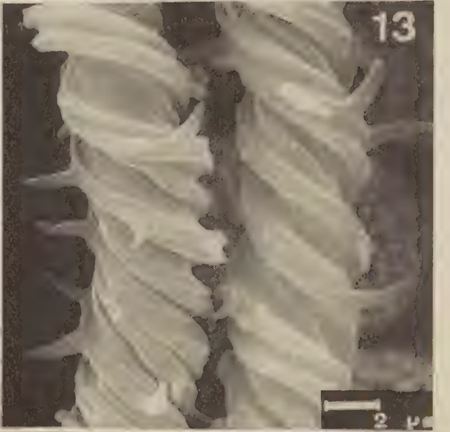
Figs. 9-15. *Metatrichia vesparium* (AH, 13253). Figs. 9, 10. Group of sporangia. Fig. 11. Capillitium. Figs. 12, 13. Capillitium with spiral bands and short spines, SEM. Figs. 14, 15. Spore ornamentation with pila showing verrucose apex, SEM.

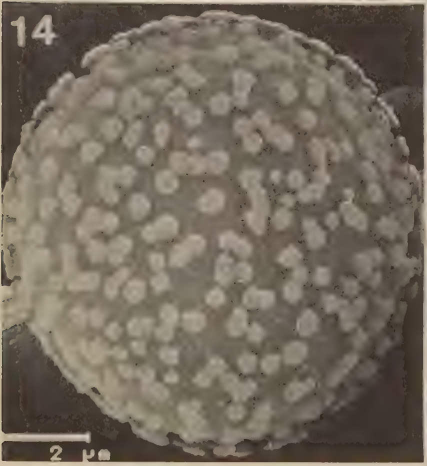

9
1mm

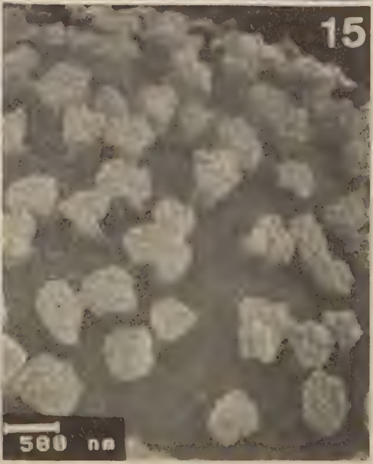

10
1mm


11
1mm


12
5 μm


13
2 μm


14
2 μm


15
500 nm

ACKNOWLEDGMENTS

This work has been possible through a research project included in the "Programa de Cooperación con Iberoamérica, Ministerio de Educación y Ciencia, Subdirección General de Cooperación International", Spain, and through research project DGICYT PB 95-0129. M. Lizárraga wishes to express his gratitude to the Consejo Nacional de Ciencia y Tecnología (CONACYT) of México for granting a fellowship to undertake a Ph.D. thesis on the Myxomycetes of Baja California. Drs. G. Moreno and C. Illana thank the Universidad de Alcalá for financing a brief stay at the Universidad Autónoma de Baja California. We also thank J. A. Perez and A. Priego of "Servicio de Microscopía Electrónica de la Universidad de Alcalá" for their help with the SEM, and to Mr. T. Palmer and Dr. F. Pando for the revision of the original manuscript.

REFERENCES

Almeida M. G. 1974. Contribuiçao para o conhecimento dos Myxomycetes de Angola. II. *Bol. Soc. Brot.* 48: 187-203.

Härkonen M. & Saarimäki T. 1991. Tanzanian Myxomycetes: first survey. *Karstenia* 31: 31-54.

Ing B. 1964. Myxomycetes from Nigeria. *Trans. Brit. Mycol. Soc.* 47: 49-55.

Lakhanpal T. N. & Mukerji K. G. 1976. Taxonomic studies on Indian Myxomycetes V. The genus Metatrichia B. Ing. *Proc. Indian. Natl. Sci. Acad., B.* 42: 125-129, 2 pl.

Lizárraga M., Moreno G. & Illana C. 1997. The Myxomycetes from Baja California (Mexico). I. *Mycotaxon* 63: 287-300.

Lizárraga M., Moreno G., Illana C. & Castillo C. 1996. Two new species of Myxomycetes from Mexico. *Abstr. 2nd. Intern. Congr. Syst. Ecol. Myxomycetes*: 56.

Martin G.W. & Alexopoulos C.J. 1969. *The Myxomycetes*. University of Iowa Press. 560 pp.

Nannenga-Bremekamp N. E. 1966. Notes on Myxomycetes. X. Some new species of Licea, Reticularia, Cribraria, Dictydiaethalium, Trichia and Metatrichia. *Proc. Kon. Ned. Akad. Wetensch. C.* 69: 336-349.

Nannenga-Bremekamp N. E. 1982. Notes on Myxomycetes. XXI. The use of polarized light as an aid in the taxonomy of the Trichiales. *Proc. Kon. Ned. Akad. Wetensch. C.* 85: 541-562.

Peinado M., Alcaraz F., Aguirre F. & Delgadillo J. L. 1995. Major plant associations of warm North American Deserts. *J. Veg. Sci.* 6: 79-94.

Rammeloo J. 1981. *Flore illustrée des champignons d' Afrique Centrale*. Fascicules 8-9. Trichiales (Myxomycetes). Jardin Botanique National de Belgique.

Rammeloo J. 1984. *Icones Mycologicae 35-54*. Jardin Botanique National de Belgique. Meise.

MYCOTAXON

Volume LXIV, pp. 393-399 September 1997

CONFIRMATION OF THE PRESENCE OF *DICTYOCEPHALOS ATTENUATUS* (GASTEROMYCETES) IN EUROPE

G. MORENO [1], A. ALTÉS [1] & H. KREISEL [2]

[1] Departamento de Biología Vegetal, Universidad de Alcalá, E-28871 Alcalá de Henares, Madrid, Spain
[2] Institut für Mikrobiologie, Ernst-Moritz-Arndt-Unversität, Ludwig-Jahn-Str. 15a, D-17487 Greifswald, Germany

SUMMARY: Four new records of *Dictyocephalos attenuatus* on the Iberian Peninsula allow us to confirm the presence of this interesting species in Europe. Photographs of the material and of its microscopic characters are included.

Key words: *Dictyocephalos attenuatus*, Gasteromycetes, chorology, taxonomy, Spain, Europe.

INTRODUCTION

A few years ago we announced the first and at that time unique record of *Dictyocephalos attenuatus* Long & Plunkett in Europe (WRIGHT *et al.*, 1993). The specimen, consisting of only one basidiocarp collected in Alcalá de Henares, Madrid (Spain), was very old and was not in best conditions for conservation when it was collected. As indicated in the paper mentioned above, this fact caused some difficulties for a determination with absolute safety, in particular considering the similarity of some of its characters with those of *Phellorinia herculanea* (Pall.: Pers.) Kreisel, especially the microscopy of the gleba. After studying several collections of *D. attenuatus* from American herbaria (BPI, NY) we consider sure to include our specimen in the concept of this species. We are conscious that, in spite of this caution, the identification of that Spanish material surely will have caused some doubts, due to its deteriorated aspect. But now we are in condition to confirm the presence of this surprising species in Spain and

Europe, thanks to the collection of four more basidiocarps from the region of Los Monegros, Zaragoza. These specimens have been doposited in the herbarium of Dpto. Biología Vegetal of the Universidad de Alcalá (AH), and in the personal herbarium of H. Kreisel (Greifswald, Germany). Here we indicate the principal characters of this material.

DESCRIPTION

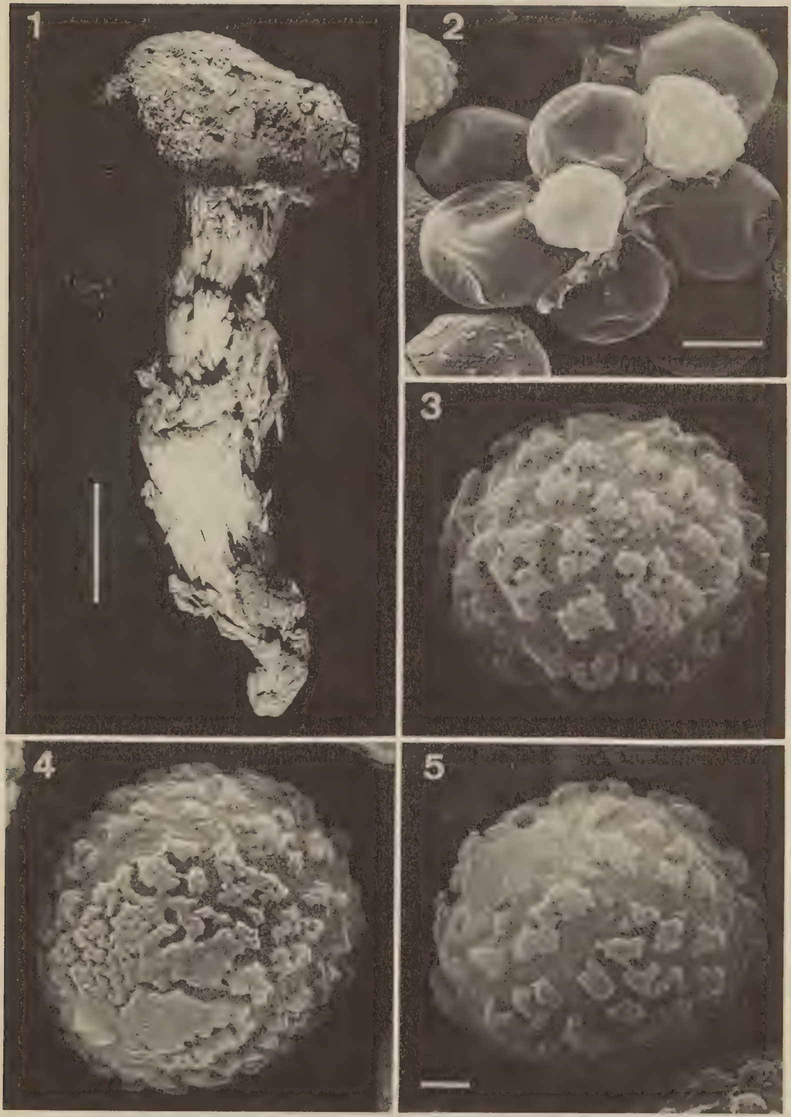
Dictyocephalos attenuatus (Peck) Long & Plunkett, *Mycologia* 32(6): 697, 1940. (FIGS. 1-8)

= *Battarrea attenuata* Peck, *Bull. Torrey Bot. Club* 22: 208, 1895.
= *Dictyocephalos curvatus* Underw. *in* V.S. White, *Bull. Torrey Bot. Club* 28(8): 421-444, 1901.
= *Phellorinia gigantea* Maire & Pat., *Bull. Soc. Hist. Nat. Afrique N.* 20(9): 279-281, 1929, fide MALENÇON (1951).

Material studied: SPAIN: Zaragoza, Bujaraloz, *leg.* H. Kreisel, K. Kreisel & G. Moreno, 17.II.1995, herb. Kreisel; *ibidem*, *leg.* G. Moreno & M. Lizárraga, 21.X.1995, AH 18815; *ibidem*, *leg.* G. Moreno & A. Altés, 31.X.1995, AH 19028; *ibidem*, *leg.* G. Moreno, V. Bandala, L. Montoya & M. Lizárraga, 25.IX.1996, AH 18368.

Basidiocarps 255-270 mm long, with a strong disagreeable smell. Sporiferous head 68-95 mm diam., with the gleba exposed by fragmentation and desintegration of the peridium, its base forming a convex surface with recurved border. Gleba well preserved, ferrugineous, divided in small compartments by whitish membranaceous plates which are progressively eroded to give free that way the spore mass (Fig. 8). Stem 190-220 mm long and 36-40 mm thick at its half length, curved in variable degree, covered by large pellicular scales of cream colour which tend to separate (Fig. 1), and with a conspicuous volva-like structure at the base, which easily breaks in fragments of similar aspect as the scales of the stem. The insertion of the stem to the spore sac leaves a wide collarium.

Spores of 6-8 µm diam., globose-subglobose, ochraceous, ornamented with not very manifested warts and with irregular outline (Figs. 3-5), formed with the progressive fragmentation of the surface (Fig. 4). As parts of the gleba, numerous groups or fascicles of subglobose cells of 8-12 µm diam. are visible (Fig. 2), which may correspond to persistent basidia or basidioles. Moreover, some thin-walled, hyaline hyphae of 3-4 µm diam. appear in the gleba; they are tortuous, frequently septate with not inflated



Figs. 1-5 — *Dictyocephalos attenuatus* AH 18815. 1: Basidiocarp. 2: Group of basidia in mature gleba. 3-5: Spores.

septa, and with some ramifications. The scales of the stem are formed by hyaline, thin-walled, straight hyphae of 4-7 µm diam. which are arranged in parallel order, without clamps, not branched, and with frequent, not inflated septa.

The SEM photographs have been obtained following the method described by MORENO *et al.* (1995).

OBSERVATIONS

In this case the basidiocarps were perfectly developed and mature. They seemed to have emerged from the substrate shortly before they were found; therefore their state of conservation was really excellent (Figs. 1, 7), with exception of the exoperidium which was very fragmented. All characters of the new specimens are typical of *Dictyocephalos attenuatus* and correspond plainly with those observed in American collections (LONG & PLUNKETT, 1940). Consequently, we think that there are no more objective reasons to doubt the presence of this species on the European continent.

For two reasons we regard important to indicate the record of these basidiocarps of *Dictyocephalos attenuatus.* At first, it concerns a taxon poorly known in global scale, with a few records in only few localities in North America, Africa (LONG & PLUNKETT, 1940) and Central Asia (SCHWARZMAN & FILIMONOVA, 1970). Therefore, the development of four basidiocarps within a limited area and within a rather short period of time was really surprising, keeping in mind a species being so infrequent as this one. Secondly, *D. attenuatus* is a species bound to xeric or subdesertic areas. This regions generally include a very important biological wealth and an enormous scientific potential. Unfortunately, many of these so vulnerable ecosystems are progressively destroyed, although we still are beginning to know the organisms which are adapted in so astonishing manner to their hard conditions.

Dictyocephalos attenuatus was found up to date in Spain fruiting near plants as *Kochia prostrata* (L.) Schrader and *Atriplex halimus* L. (Fig. 6), in plant communities of the association *Artemisio herba-albae-Salsoletum vermiculatae* (Br.-Bl. & O. Bolós 1957) O. Bolós 1967, a type

---

Figs. 6-8 — *Dictyocephalos attenuatus* AH 19028. 6: Aspect of the site where the fruitbody was collected. 7: Basidiocarp. 8: Detail of the sporiferous head.

6

7
1 cm

8
1 cm

of halonitrophilous matorrals with saharo-indian and irano-turanic affinities (PEINADO *et al.*, 1988), which has its optimum in Spain over clay-marl miocenic sediments, rhich in chlorides. In general, the plant communities of this association are extreme stages of degradation of climatophilous oak woods of *Quercetum rotundifoliae* Br.-Bl. & O. Bolós 1957.

Some years ago MARTÍN & ROCABRUNA (1988) have recorded from the same region of Los Monegros *Phellorinia herculanea*, a species which microscopically is very similar to *Dictyocephalos attenuatus*. But, their macroscopic features allow distinguish them: the stipe of *Ph. herculanea* is continuous with the peridium, without collarium, and its gleba is supported by a concave, cup-like surface, and not divided in compartments. The fructification of both taxa in the same geographic area was stated already by MALENÇON (1935, 1936) in North Africa. *Chlamydopus meyenianus* (Klotzsch) Lloyd has similar microscopic characters as *Dictyocephalos* Underw. and *Phellorinia* Berk., but its macromorphology is different from both and may be mistaken for *Tulostoma* Pers.: Pers. in the field. The genera *Phellorinia, Dictyocephalos,* and *Chlamydopus* Speg. form a clearly delimited phylogenetic line, regarded as family Phelloriniaceae Ulbr. 1952 (so accepted, among others, by KREISEL 1969, and JÜLICH 1981), characterized by the persisting basidia. However HAWKSWORTH *et al.* (1995) distribute them among two families (*Dictyocephalos* and *Phellorinia* in Phelloriniaceae, and *Chlamydopus* in Tulostomataceae E. Fisch.), and DRING (1973) had classified all mentioned genera under Tulostomataceae, together with *Battarrea* Pers., *Battarreoides* T. Herrera, *Queletia* Fr. and *Schizostoma* Ehrenb.: Fr.

ACKNOWLEDGEMENTS

We wish to express our thanks to Prof. Dr F.D. Calonge for the critical revision of the manuscript, and to Dr M. Peinado for phytosociological data. We are thankful to J.A. Pérez and A. Priego for their collaboration with SEM. We also thank for financial support conceded by the Programa de Cooperación con Iberoamérica, Ministerio de Educación y Ciencia, Spain.

REFERENCES

DRING, D.M. (1973). *Gasteromycetes. In*: AINSWORTH, G.C. & A.S. SUSSMAN (eds.). The Fungi, vol. IV B, p. 451-478. Academic Press, New York, London.

HAWKSWORTH, D.L., P.M. KIRK, B.C. SUTTON & D.N. PEGLER, eds. (1995). *Ainsworth & Bisby's Dictionary of the Fungi*. 8th ed. CAB International, Kew. 616 pp.

JÜLICH, W. (1981). *Higher Taxa of Basidiomycetes.* J. Cramer, Vaduz. 485 pp.

KREISEL, H. (1969). *Grundzüge eines natürlichen Systems der Pilze*. J. Cramer, Lehre. 245 pp.

LONG, W.H. & O.A. PLUNKETT (1940). Studies in the *Gasteromycetes.* I. The genus *Dictyocephalos. Mycologia* 32: 696-709.

MALENÇON, G. (1935). Études sur les Phellorinés. II. Le *Dictyocephalus curvatus* Underwood. *Ann. Cryptog. Exot.* 8: 101-132.

MALENÇON, G. (1936). Donnés phytogéographiques sur quelques champignons marocains. *Bull. Soc. Sci. Nat. Maroc* 4: 30-31.

MALENÇON, G. (1951). Études sur les Phellorinés. III. *Dictyocephalus attenuatus* (Peck) Long et Plunkett, et *Phellorina gigantea* R. Maire et Patouillard. *Rev. Mycol. (Paris)* 16: 101-107.

MARTÍN, M.P. & A. ROCABRUNA (1988). *Phellorinia herculeana* (Pallas: Pers.) Kreisel en Los Monegros. *Bull. Soc. Catalana Micol.* 12: 83-92.

MORENO, G., A. ALTÉS, C. OCHOA & J.E. WRIGHT (1995). Contribution to the study of the *Tulostomataceae* in Baja California, México, I. *Mycologia* 87: 96-120.

PEINADO, M., J.M. MARTÍNEZ-PARRAS, C. BARTOLOMÉ & F. ALCARAZ (1988). Síntesis sintaxonómica de la clase *Pegano-Salsoletea* en España. *Doc. Phytosoc.* 11: 283-301.

SCHWARZMAN, S.R. & N.M. FILIMONOVA (1970). *Gasteromycetes.* Flora Sporovych rastenij Kazakhstana, Tom VI. Izd. Nauka, Alma-Ata. 318 pp. (in Russian).

WRIGHT, J.E., G. MORENO & A. ALTÉS (1993). *Dictyocephalos attenuatus (Gasteromycetes, Basidiomycotina)* new for Europe. *Cryptog. Mycol.* 14: 77-83.

MYCOTAXON

Volume LXIV, pp. 401-403 September 1997

PODOSCYPHA WARNECKEANA

LEIF RYVARDEN

Botany Department, Biological Institute, University of Oslo,
P.O. Box 1045, Blindern, N-0316 Oslo, Norway.

Introduction

A little into the rainy season in Africa, a small stipitate steroid fungus becomes very evident on the ground, always growing on dead culms or tufts of different grasses. It was first described in 1905 as *Stereum warneckeanum* P. Hennings, based on a collection from Lomé, in the republic of Togo. Later Saccardo (1917) described it anew, this time from Eritrea, as *Craterellus dongolensis* Sacc. Since then it has been recorded in a long series of countries throughout Africa south of the Sahara and South East Asia. For a complete list of localities, see Reid (1965:217).

In his monograph of the stipitate stereoid fungi Reid (op. cit) reduced the taxon to a variety of *Podoscypha nitidula* (Berk.) Pat. stating that the spores of the two taxa "are virtually identical" (op. cit. p. 218). In January 1994 the rains in Zimbabwe were very heavy and *Stereum warneckeanum* became evident wherever grasses were growing. A fair number of specimens were collected, spore prints were taken and the fungus was brought fresh to Oslo for freeze drying.

An examination of the spore prints and the freezedried specimens revealed that the spores of this taxon are significantly larger than those of *Podoscypha nitidula.* I feel therefore that it should be kept as a separate species. Also supporting this status are the grossly different habitats occupied by the two taxa: *P. nitidula* always grows on dead wood, while *S. warneckeanum* is restricted to dead culms of grasses. The hyphal system of *S. warneckeanum* is distinctly dimitic and the species should clearly be placed in *Podoscypha* as is the case with *P. nitidula.*

Podoscypha warneckeana (Henn.) Ryv. comb. nov.
Basionym: *Stereum warneckeanum* Henn. Bot. Jahrb. 38:120, 1905. - *Craterellus dongolensis* Sacc. Atti Acad. Sci. Lett. Arti Padova 33:185, 1917.

Basidiocarp stipitate, infundibuliform, sometimes split and more fan shaped, up to 3 cm high and 2 cm wide, soft and semi-transparent when fresh, upper surface smooth and glabrous, pink to buff, becoming brown, often with some slight concentric darker zones or lines, hymenophore smooth, ochre to pale grey or buff, stipe round to flattened, rarely above 1 cm high and 3 mm in diam, grey to pale brown, at the base often swollen at the point of attachment.

Hyphal system dimitic, generative hyphae with clamps, 2-4 µm wide, thin-walled, skeletal hyphae thick-walled to almost solid, 2-5 µm wide, often with adventitious septa and a rounded apex.

Pileocystidia absent.

Gloeocystidia present, thin-walled and with a yellowish content, slightly tapering towards the apex, up to 50-140 x 8-15 µm arising both in the subhymenium and in the hymenium, projecting up to 15 µm beyond the basidia.

Basidia clavate, forming a dense palisade, 30-45 x 4-8 µm and with four sterigmata, occasionally 2-spored basidia are observed.

Basidiospores broadly ellipsoid, smooth, thin-walled and with a large oildrop, 6.5-7.5 (8) x 4.5-6 µm.

Substrate. Culms or tufts of dead grasses.

Distribution. Throughout Africa south of the Sahara, Hong Kong, Malaysia, Pakistan and India.

Remarks. The basidiospores of *P. nitidula* measure 3.75-5.75 x 3-4 µm, thus considerably smaller than those cited above for *P. warneckeana*. This and the habitat make it easy to separate the two species in the field.

Acknowledgements
Peter Roberts of Kew Gardens, London, has kindly read the manuscript and suggested linguistic improvements for which I am grateful. Annarosa Bernicchia of Instituto di Patologia Vegetale, Bologna, has been most helpful in find difficult accessible literature.

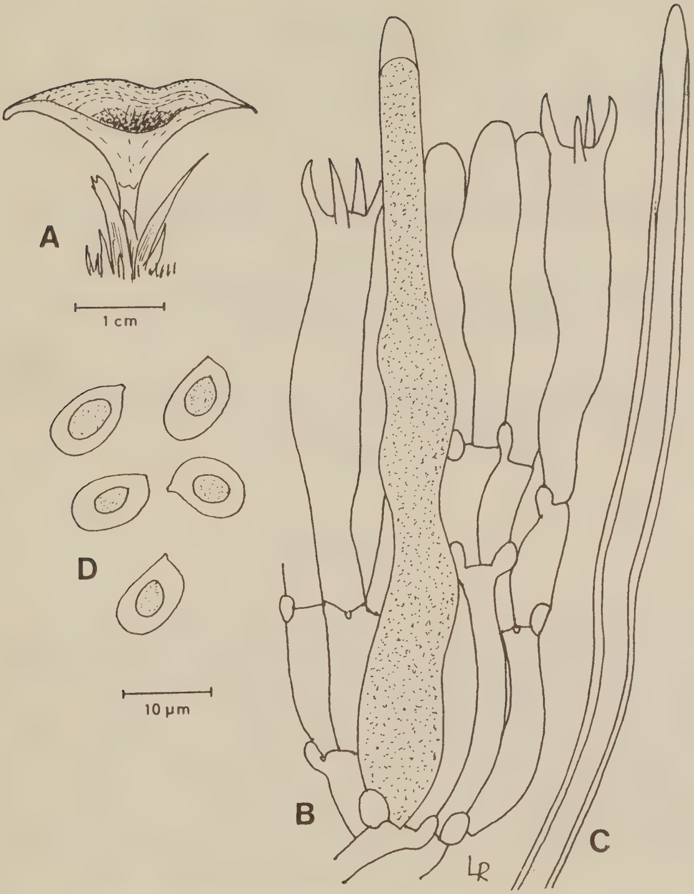


Fig. 1. *Podoscypha warneckeana*. A) Basidiocarp, part of hymenium with basidia and a gloeocystidium, C) Apical part of a skeletal hypha, D) Basidiospores. Coll.: Zimbabwe, Midland Prov. Mazawe. 30. Jan. 1994. Ryvarden 33926 (O).

References

Hennings, P. 1905: Fungi camerunensis IV. Engl. Bot. Jahrb. 38:119-129.
Reid, D. A. 1965: A monograph of the stipitate stereoid fungi. Beih. Nova Hedwigia 18:1-382.
Saccardo, P. A. 1917: Manipolo di Funghi nuovi o piu notevoli. Atti Accad. Sci. Lett. Arti Padova 33:157-195.

MYCOTAXON

Volume LXIV, pp. 405-430 September 1997

CERCOSPOROID FUNGI FROM BRAZIL. 1.

PEDRO W. CROUS
*Department of Plant Pathology, University of Stellenbosch,
P. Bag X1, Matieland 7602, South Africa*

ACELINO C. ALFENAS AND ROBERT W. BARRETO
*Departemento de Fitopatologia, Universidade Federal de
Viçosa, 36.570 Viçosa, MG, Brazil*

ABSTRACT

This paper represents the first in a series dealing with the systematics of cercosporoid fungi from Brazil. The present study revises 22 *Cercospora* species reported or described from Brazil by Viégas in 1945. Several new combinations and synonymies are made in *Passalora*, *Phaeoisariopsis*, *Pseudocercospora* and *Mycovellosiella*. In addition, *Mycosphaerella eugenicola* is newly described as the teleomorph of *Pseudocercospora sphaerellae-eugeniae* (Sacc.) Crous, Alfenas & R.W. Baretto comb. nov. from leaves of *Eugenia uniflora*.

INTRODUCTION

Cercosporoid fungi are commonly associated with leaf spot diseases of numerous host plants world-wide. Other than just plant pathogens, some have also been found to be potential biocontrol agents of weeds and other exotic plants (Morris & Crous, 1994; Barreto & Evans, 1995). Although these fungi are common in Brazil and other countries in South America, they have generally been poorly studied from this region. The most significant treatment of these taxa from Brazil was undoubtedly that of Viégas (1945), which was later incorporated into Chupp (1954). Since then, however, there have only been fragmented treatments of Brazilian cercosporoids by workers such as Deighton, Sutton, Braun and others (Ellis, 1976; Dianese, Sutton & Tessman, 1993; Dianese & Câmara, 1994; Medeiros & Dianese, 1994; Barreto & Evans, 1995; Crous & Alfenas, 1995; Crous & Braun, 1996; Inácio *et al.*, 1996). The aim of this project, therefore, was to systematically revise records of this group of fungi from Brazil. The present study focuses on some specimens collected and described by Viégas, and lodged in the herbarium at Campinas (IACM).

SPECIES CONSIDERED

1. ***Cercospora ceibae*** Chupp & Viégas, *Bol. da Soc. Brasil. de Agron.* **8**, 17. 1945.

Specimen: São Paulo, Campinas, Fazenda Sta. Elisa, *Eriodendron anfractuosum* (as *Ceiba pentandra*), 10 Sept. 1937, A.S. Costa, IACM 2120 (holotype).

Although the illustration given by Viégas (1945) suggested that it could be a species of *Passalora*, the conidia were hyaline, acicular, with subacute apices and truncate bases, mostly straight, indistinctly multi-septate, 20-95 x 2-4 µm. Based on the hyaline conidia and scar structures, this species is best retained in *Cercospora*.

2. ***Cercospora glauciana*** Viégas, *Bol. da Soc. Brasil. de Agron.* **8**, 27. 1945.

Leaf spots amphigenous, forming dark concentric lesions 10-20 mm long. *Mycelium* internal, composed of smooth, branched, hyaline hyphae, 3-4 µm diam. *Caespituli* fasciculate, amphigenous, brown. *Conidiophores* aggregated in loose fascicles, arising from the upper cells of a weakly developed substomatal stroma; conidiophores medium brown, smooth, subcylindrical, straight to variously curved, unbranched, 3-4-septate, 40-120 x 4-5 µm. *Conidiogenous cells* integrated, terminal, light brown, smooth, tapering to flat-tipped loci, proliferating sympodially, 10-25 x 3-4 µm. *Conidia* solitary, hyaline, smooth, guttulate, subcylindrical, apex subobtuse, base narrowly obconically truncate, straight, 1-4-septate, 20-45 x 2-3.5 µm; hila thickened, darkened, refractive.

Specimen: São Paulo, Campinas, Fazenda Sta. Elisa, *Bulbostylis major*, 18 Feb. 1943, A.P. Viégas, IACM 4141 (holotype).

Chupp (1954) stated that he did not see the type specimen. A re-examination of the latter in this study, however, confirmed it to be a typical *Cercospora* species.

3. *Cercospora papayae* Hansf., *Proc. Linn. Soc. London* **1942-1943**, 58. 1943. Fig. 1

Cercospora papayae Viégas & Chupp, *Bol. da Soc. Brasil. de Agron.* **8**, 42. 1945. (homonym)

Cercospora mamaonis Viégas & Chupp, *A monograph of the fungus genus* Cercospora, p. 107. 1954.

Leaf spots amphigenous, irregular to sub-circular, 5-15 mm diam., light brown on adaxial surface, light to median brown on the abaxial surface with a raised border; coloured margin absent. *Mycelium* internal, composed of smooth, branched, hyaline hyphae, 2-3 µm diam. *Caespituli* fasciculate, amphigenous, brown. *Conidiophores* aggregated in loose to dense fascicles, arising from the upper cells of a medium brown stroma up to 80 µm wide and 30 µm high; conidiophores medium brown, smooth, subcylindrical, straight to once geniculate, unbranched, 1-5-septate, 55-95 x 5-7 µm. *Conidiogenous cells* integrated, terminal, unbranched, medium to light brown, smooth, tapering to rounded apices, proliferating sympodially, subcylindrical, straight, rarely once geniculate, 25-40 x 5-8 µm. *Conidia* solitary, hyaline, smooth, guttulate, acicular, apex subobtuse to subacute, base truncate, straight to curved, 1-18-septate, 40-190 x 3-5 µm; hila thickened, darkened, refractive.

Specimen: São Paulo, Inst. Agron. do Estado, Campinas, *Carica papaya*, 1 May 1936, A.S. Costa, IACM 613 (holotype of *C. papayae* Viégas & Chupp).

Cercospora papayae Viégas & Chupp (1945) is a later homonym of *C. papayae* Hansf. (1943), which resulted in Chupp (1954) proposing a new name, *C. mamaonis* Viégas & Chupp for the former species. An examination of the type specimen of *C. mamaonis* (IACM 613) showed several inconsistensies with the descriptions of Viégas (1945) and Chupp (1954). Conidia were acicular, and much larger than that given by Viégas (40-90 x 3.5-4 µm) and Chupp (10-45 x 2-3 µm). Chupp also referred to conidia as being cylindrical, but this may be due to him only observing small conidia. In the original illustration Viégas illustrated conidia as being obclavate to acicular with subacute apices and obconically truncate bases. *C. papayae* Hansf. is very similar, but Chupp stated that it had longer conidiophores (50-200 x 3.5-6 µm), and variously curved acicular conidia (20-75 x 3-5 µm). However, Chupp also accepted a Chinese description as representative of *C. papayae*, with conidia 40-188 x 4-6.5 µm. Ellis (1976) also stated conidia of *C. papayae* Hansf. were 45-170 x 4-5 µm. This suggests that *C. mamaonis* and *C. papayae* Hansf. are in fact synonymous.

4. *Cercospora xylopiae* Viégas & Chupp, *Bol. da Soc. Brasil. de Agron.* **8**, 58. 1945.

Specimen: São Paulo, Ribeirão Preto Exp. Sta., Ribeirão Preto, *Xylopia grandiflora*, 30 May 1935, A.S. Costa & H.P. Krug, IACM 690 (holotype).

Although we suspected that this may not be a true *Cercospora* species due to the relatively short conidiophores situated on a stroma as illustrated by Viégas (1945), his interpretation of the conidiophores were in fact incorrect (10-15 x 2.5-4 µm). Chupp (1954) correctly described them as light brown, straight, 30-150 x 2.5-4 µm, with a thickened apical conidial locus. Conidia were hyaline to subhyaline, multi-septate, subcylindrical to obclavate, 20-70 x 2-4 µm.

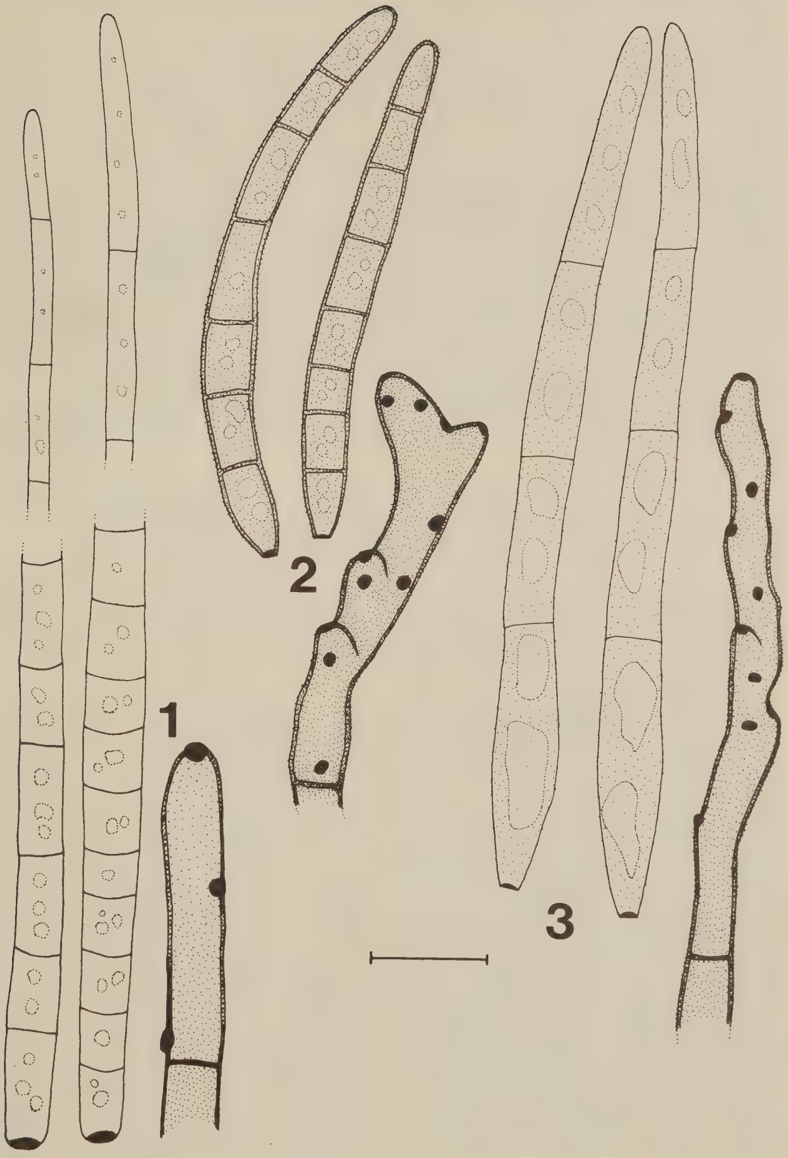
5. *Passalora arrabidaeae* (Chupp & Viégas) Crous, Alfenas & R.W. Barreto comb. nov. Fig. 2

Cercospora arrabidaeae Chupp & Viégas, *Bol. da Soc. Brasil. de Agron.* **8**, 8. 1945.

Leaf spots amphigenous, irregular to sub-circular, 1-4 mm diam., dark brown with a diffuse, light brown margin. *Mycelium* internal, composed of finely verruculose, branched, light brown

---

Figs 1-3. Conidia and conidiogenous cells of *Cercospora* and *Passalora* spp. Fig. 1. *Cercospora papayae* (IACM 613). Fig. 2. *Passalora arrabidaeae* (IACM 37267). Fig. 3. *Passalora campinensis* (IACM 3727; scale bar = 10 µm).



hyphae, 3-4 µm diam. (Viégas also illustated some superficial hyphae to be present). *Caespituli* fasciculate, hypophyllous, brown, up to 100 µm wide and 150 µm high. *Conidiophores* aggregated in loose to dense fascicles, arising from the upper cells of a medium brown stroma up to 60 µm wide and 30 µm high; conidiophores medium brown, finely verruculose, subcylindrical, straight to geniculate-sinuous, unbranched or branched above, 1-10-septate, 20-80 x 5-6 µm. *Conidiogenous cells* integrated, terminal, branched or not so, light to medium brown, finely verruculose, subcylindrical, tapering to rounded apices, or becoming slightly clavate near apex with several flat-tipped, thickened, refractive apical loci, proliferating sympodially, 20-40 x 5-6 µm. *Conidia* solitary, light brown, finely verruculose, guttulate, narrowly obclavate to subcylindrical, apex obtuse to subobtuse, base obconically truncate, straight to curved, 3-20-septate, 35-180 x 3.5-5 µm; hila thickened, darkened, refractive.

Specimen: São Paulo, Cerrado, Mogi-Mirim, *Arrabidaea platyphylla*, 27 Feb. 1941, A.P. Viégas & A.S. Costa, IACM 3726 (holotype).

6. ***Passalora campinensis*** (Chupp & Viégas) Crous, Alfenas & R.W. Barreto comb. nov. Fig. 3

Cercospora campinensis Chupp & Viégas, *Bol. da Soc. Brasil. de Agron.* **8**, 14. 1945.

Leaf spots amphigenous, irregular to sub-circular, 2-4 mm diam., white-brown at centres, becoming medium brown towards a raised border; margin dark brown, diffuse. *Mycelium* internal, composed of smooth, branched, light brown hyphae, 3-4 µm diam. (Viégas also illustated some superficial hyphae to be present). *Caespituli* fasciculate, hypophyllous, brown, up to 50 µm wide and 200 µm high. *Conidiophores* aggregated in loose fascicles, arising from the upper cells of a minute brown stroma up to 35 µm wide and 20 µm high; conidiophores medium brown, finely verruculose, cylindrical, straight to slightly curved, unbranched, 2-7-septate, 40-200 x 3-5 µm. *Conidiogenous cells* integrated, terminal, unbranched, light brown, smooth to finely verruculose, subcylindrical, tapering to rounded apices, with several flat-tipped, thickened, refractive apical loci, proliferating sympodially, 30-50 x 3-4 µm. *Conidia* solitary, light brown, smooth to finely verruculose, guttulate, obclavate, apex subobtuse, base obconically truncate, straight to slightly curved, 1-5-septate, 25-90 x 3.5-6 µm; hila thickened, darkened, refractive.

Specimen: São Paulo, near Mogy-Mirim, unidentified Myrtaceae, (not *Eucalyptus*, possibly *Psidium* or *Eugenia*), 27 Feb. 1941, A.P. Viégas & A.S. Costa, IACM 3727 (holotype).

The obclavate conidia of *P. campinensis* (1-5-septate, 25-90 x 3.5-6 µm) are similar to those of *Passalora syzygii* (M. Mandal) B. Sutton & Crous (1-7-septate, 35-80 x 3-5 µm), which occurs on *Syzygium cumini* in India (Sutton & Crous, 1996). However, conidiophores and conidiogenous cells of *P. campinensis* (40-200 x 3-5 µm; 30-50 x 3-4 µm) are much longer and narrower than those of *P. syzygii* (50-90 x 4.5-6 µm; 10-17 x 5-6 µm). The two species are further distinguished in general symptomatology and pigmentation of their conidiophores and conidia.

7. ***Passalora colubrinae*** (Chupp & Viégas) Crous, Alfenas & R.W. Barreto comb. nov. Fig. 4

Cercospora colubrinae Chupp & Viégas, *Bol. da Soc. Brasil. de Agron.* **8**, 20. 1945.

Leaf spots amphigenous, irregular to angular, 1-5 mm diam., grey in centre, becoming dark brown towards an indistinct border; coloured margin absent. *Mycelium* internal, composed of smooth, branched, light brown hyphae, 3-4.5 µm diam. *Caespituli* sporodochial, acervuli-like, becoming fasciculate, amphigenous, brown, up to 270 µm wide and 170 µm high. *Conidiophores* aggregated in loose to very dense fascicles, arising from the upper cells of a minute brown stroma up to 150 µm wide and 70 µm high; conidiophores medium brown, finely verruculose to verruculose, cylindrical, straight to geniculate-sinuous, unbranched or branched above, 1-7-septate, 30-120 x 4-9 µm. *Conidiogenous cells* integrated, terminal and lateral, light to medium brown, finely verruculose, subcylindrical, tapering to rounded apices with thickened, refractive loci, proliferating sympodially, 20-45 x 4-8 µm. *Conidia* solitary, olivaceous to pale brown, smooth to finely verruculose, granular and guttulate, subcylindrical to obclavate, apex subobtuse, base obconically truncate, straight to curved, 1-5-septate, 20-65 x 4-6.5 µm; hila thickened, darkened, refractive.

Specimen: São Paulo, Piracicaba, Escola Agricola, "Luiz de Queroz", *Colubrina rufa*, 7 Sept. 1933, A.S. Costa, IACM 267 (holotype).

8. ***Passalora fuligniosa*** (Ellis & Kellerm.) Crous, Alfenas & R.W. Barreto comb. nov. Fig. 5

Cercospora fuligniosa Ellis & Kellerm., *Jour. Mycol.* **3**, 103. 1887.
Cercospora atra Ellis & Everh., *Jour. Mycol.* **4**, 4. 1888.
Cercospora diospyri Viégas, *Bol. da Soc. Brasil. de Agron.* **8**, 23. 1945, non Thuem. 1874.

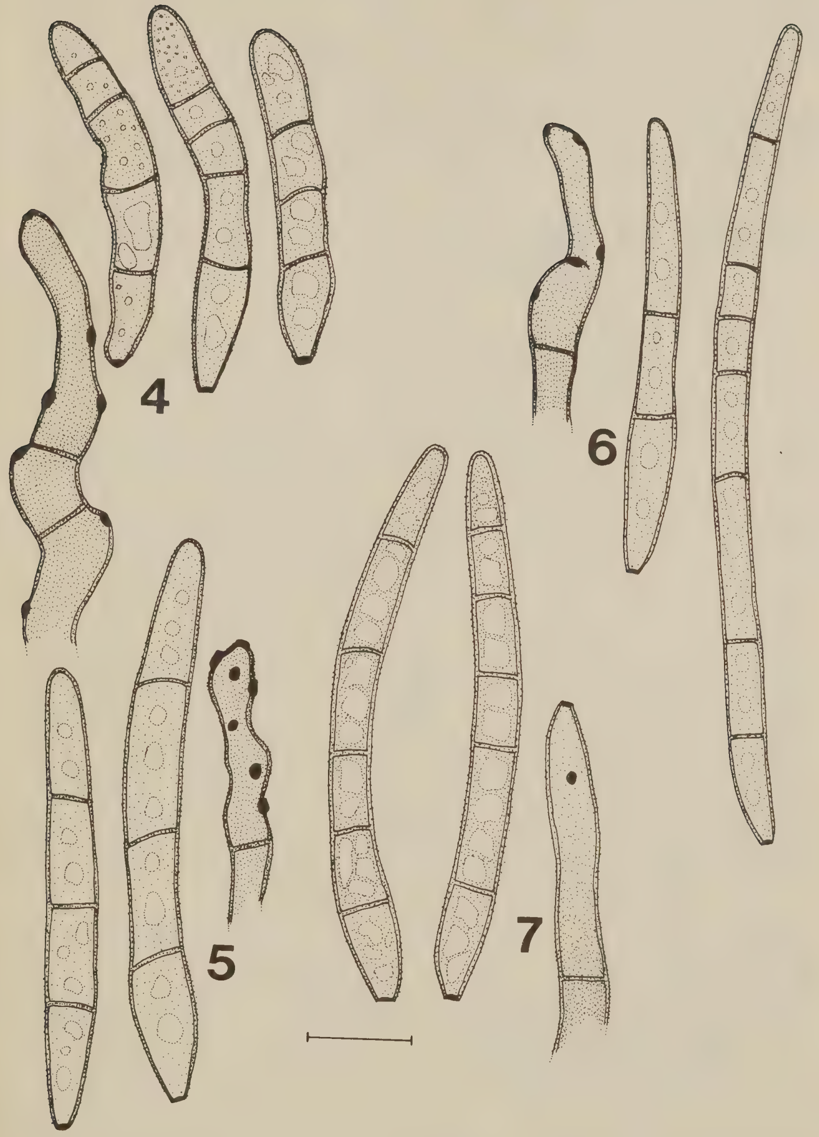
Leaf spots amphigenous, irregular to sub-circular, 2-7 mm diam., dark brown with indistinct margins on adaxial surface, medium brown with a raised, dark brown border and margin on the abaxial surface. *Mycelium* internal, composed of smooth, branched, light brown hyphae, 2-3 µm diam. *Caespituli* fasciculate, hypophyllous, dark brown, up to 60 µm wide and 100 µm high. *Conidiophores* aggregated in dense fascicles, arising from the upper cells of a brown stroma up to 50 µm wide and 20 µm high; conidiophores medium to dark brown, finely verruculose, subcylindrical, straight to slightly curved, unbranched, 2-5-septate, 30-110 x 3-5 µm. *Conidiogenous cells* integrated, terminal, light to medium brown, finely verruculose, subcylindrical, tapering to flat-tipped, thickened, refractive apical loci, proliferating sympodially, 20-40 x 3-4 µm. *Conidia* solitary, olivaceous to pale brown, finely verruculose, guttulate, subcylindrical to narrowly obclavate, apex obtuse, base obconically truncate, straight to slightly curved, 1-3-septate, 25-70 x 3-5 µm; hila thickened, darkened, refractive.

Specimen: Minas Gerais, Belo Horizonte, Jardim Botanico, *Diospyros hispida,* 30 Jan. 1943, A.P. Viégas, IACM 4134 (holotype of *C. diospyri*).

Several cercosporoid taxa with pigmented conidia have recently been described from this host (Hsieh & Goh, 1990; Crous & Braun, 1995). Chupp (1954), who examined Viégas's material, considered *C. diospyri* to be a synonym of *C. fuligniosa*. The

---

Figs 4-7. Conidia and conidiogenous cells of *Passalora* and *Phaeoramularia* spp. Fig. 4. *Passalora colubrinae* (IACM 267). Fig. 5. *Passalora fuligniosa* (IACM 4134). Fig. 6. *Phaeoramularia pyrostegiae* (IACM 167). Fig. 7. *Passalora ubatubensis* (IACM 3310; scale bar = 10 µm).



synonymy of *C. atra* with *C. fuligniosa* was earlier made by Ellis (1888). Saccardo & Sydow (1899) stated that the name *C. fuligniosa* is a typographical error, and suggested using the name *C. fulignosa*. However, since they used this name for a species occurring on *Ceanothus*, Chupp recommended that *C. atra* be used instead. In allocating this name to *Passalora*, we chose to retain the original name with its typographical error, as any further changes would have resulted in unnecessary confusion.

9. *Passalora ubatubensis* (Chupp & Viégas) Crous, Alfenas & R.W. Barreto comb. nov. Fig. 7

Cercospora ubatubensis Chupp & Viégas, *Bol. da Soc. Brasil. de Agron.* **8**, 55. 1945.

Pseudocercospora ubatubensis (Chupp & Viégas) Deighton, *Mycol. Pap.* **140**, 155. 1976.

Leaf spots amphigenous, sub-circular to circular, 3-14 mm diam., light brown, border slightly raised, medium brown; coloured margin absent. *Mycelium* internal and external, composed of finely verruculose, branched, light brown hyphae, 3-4 µm diam. *Caespituli* fasciculate, hypophyllous, medium brown, up to 70 µm wide and 80 µm high. *Conidiophores* aggregated in loose fascicles, arising from the upper cells of a brown stroma up to 60 µm wide and 50 µm high; conidiophores medium brown, finely verruculose, subcylindrical, straight to slightly curved, unbranched, 6-12-septate, 110-300 x 4-6 µm. *Conidiogenous cells* integrated, terminal, light brown, smooth to finely verruculose, subcylindrical, tapering to rounded apices with flat-tipped, thickened, refractive loci, proliferating sympodially, 25-45 x 4-5 µm. *Conidia* solitary, olivaceous to light brown, finely verruculose, guttulate, subcylindrical, apex obtuse, base obconically truncate, straight to slightly curved, 4-8-septate, 40-110 x 4-6 µm; hila thickened, darkened, refractive.

Specimen: São Paulo, Est. Exp. de Ubatuba, *Spermacoce alata* (*Borreria alata*), 10 Mar. 1940, A.P. Viégas, IACM 3310 (holotype).

10. *Passalora vicosae* (Muller & Chupp) Crous, Alfenas & R.W. Barreto comb. nov. Fig. 8

Cercospora vicosae Muller & Chupp, *Arquiv. Inst. Veg. Rio de Janeiro* **1**, 220. 1935.

Leaf spots predominantly hypophyllous, irregular to angular, 3-5 mm diam., concolorous to light brown on both leaf surfaces, with black caespituli on the lower surface; margins indistinct.

Mycelium internal, composed of smooth, branched, hyaline, hyphae, 3-4 µm diam. *Caespituli* fasciculate, predominently hypophyllous, black with white spore masses, up to 40 µm wide and 130 µm high. *Conidiophores* aggregated in loose to dense fascicles, arising from the upper cells of a reduced brown stroma; conidiophores medium to dark brown, finely verruculose, subcylindrical, straight to geniculate-sinuous, branched below or above, multi-septate, 60-180 x 5-6 µm. *Conidiogenous cells* integrated, terminal, light brown, finely verruculose, subcylindrical, tapering to rounded apices with flat-tipped, thickened, refractive loci, proliferating sympodially, 10-25 x 4-6 µm. *Conidia* solitary, olivaceous to pale brown, finely verruculose, guttulate, subcylindrical to narrowly obclavate, apex obtuse, base obconically truncate, straight to slightly curved, 1-5-septate, 25-100 x 4-6 µm; hila thickened, darkened, refractive.

Specimen: Minas Gerais, Viçosa-Escola, *Manihot* sp., 16 Apr. 1933, A.S. Muller, IACM 468 (holotype).

11. ***Phaeoisariopsis luheae*** **(Chupp & Viégas) Crous, Alfenas & R.W. Barreto comb. nov.** Fig. 9

Cercospora luheae Chupp & Viégas, *Bol. de Soc. Brasil. de Agron.* **8**, 36. 1945.

Leaf spots epiphyllous, circular, light brown, 1-2 mm diam., border distinct, slightly raised, dark brown. *Mycelium* internal, composed of smooth, branched, olivaceous hyphae, 3-4 µm diam. *Caespituli* fasciculate, synnematal, hypophyllous, medium brown, up to 35 µm wide and 150 µm high. *Conidiophores* aggregated in dense synnemata, arising from the upper cells of a reduced brown stroma; conidiophores medium brown, smooth, subcylindrical, straight to geniculate-sinuous, 3-7-septate, 30-90 x 3-5 µm. *Conidiogenous cells* integrated, terminal, light to medium brown, smooth, subcylindrical, tapering to clavate apices with flattened, thickened, refractive loci, proliferating sympodially, 20-45 x 5-6 µm. *Conidia* solitary, olivaceous to light brown, smooth, guttulate, subcylindrical to obclavate, apex obtuse, base obconically truncate, straight to slightly curved, 1-7-septate, 20-85 x 4-6.5 µm; hila thickened, darkened, refractive.

Specimen: São Paulo, Campinas, *Luhea* sp., 12 Apr. 1942, A.P. Viégas, IACM 4021 (holotype).

Braun (1995) separated *Passalora* from *Phaeoisariopsis* by the latter genus having long, closely appressed synnematal conidiophores, as was the case with the type specimen of *P. luheae*.

12. *Phaeoramularia pyrostegiae* (Viégas) Inácio & Dianese, *Fitopatol. Bras.* **21**, 406. 1996. Fig. 6

Cercospora pyrostegiae Viégas, *Bol. da Soc. Brasil. de Agron.* **8**, 46. 1945.

Leaf spots amphigenous, sub-circular, 1-5 mm diam., pale green, becoming light brown, border raised, medium brown, margin absent or thin and dark brown. *Mycelium* internal, composed of smooth, branched, hyaline to light brown hyphae, 2-3.5 µm diam. *Caespituli* fasciculate, amphigenous, medium brown, up to 100 µm wide and 70 µm high. *Conidiophores* aggregated in very dense fascicles, arising from the upper cells of a brown stroma up to 80 µm wide and 50 µm high; conidiophores light to medium brown, smooth, subcylindrical, straight to slightly curved, unbranched, 1-3-septate, 35-70 x 4-6 µm. *Conidiogenous cells* integrated, terminal, light brown, smooth, subcylindrical, tapering to rounded apices with flat-tipped, thickened, refractive loci, proliferating sympodially, 15-25 x 4-6 µm. *Conidia* often catenulate, olivaceous to pale brown, smooth, guttulate, cylindrical, apex obtuse, base obconically truncate, straight to slightly curved, 2-12-septate, 25-170 x 3-4.5 µm; hila thickened, darkened, refractive.

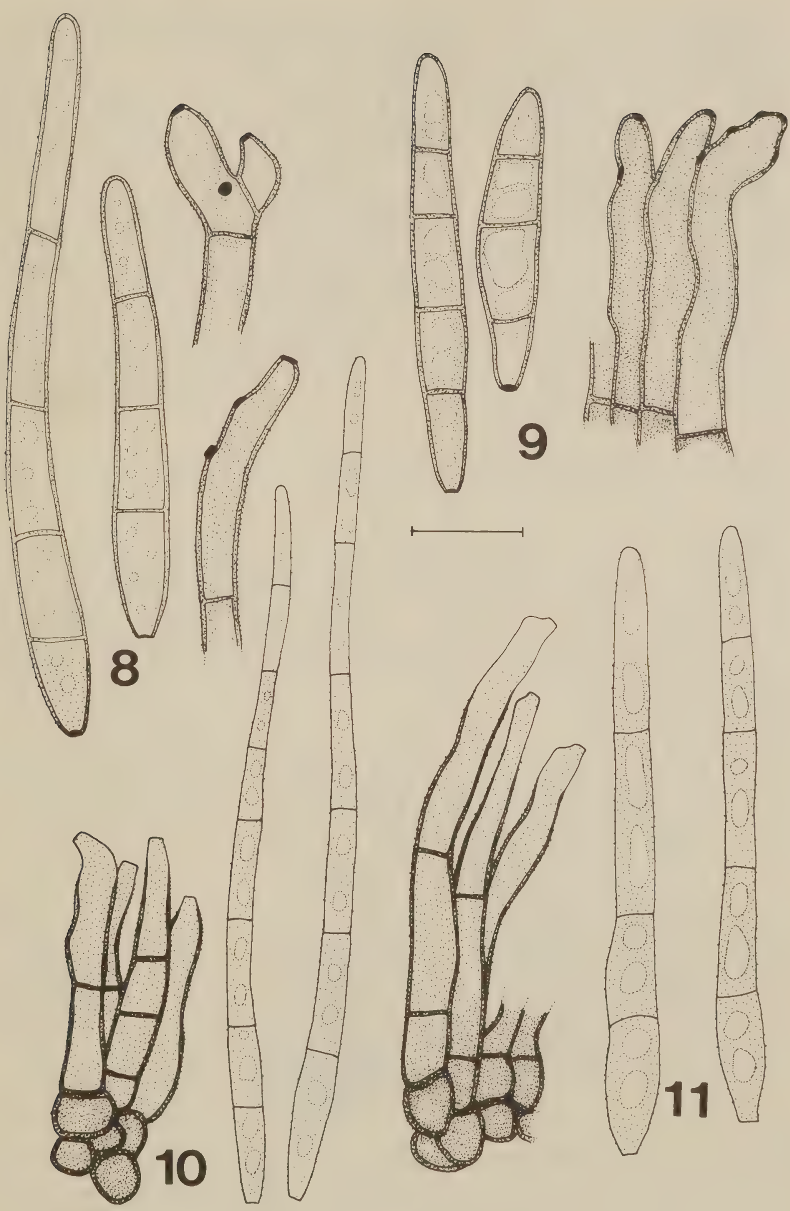
Specimen: São Paulo, Campinas, *Pyrostegia venusta*, 16 May 1933, A.P. Viégas, IACM 167 (holotype).

13. *Pseudocercospora artanthes* (Henn.) Crous, Alfenas & R.W. Barreto comb. nov. Fig. 10

Cercospora artanthes P. Henn., *Hedwigia* **48**, 18. 1909.

Leaf spots amphigenous, irregular, 2-12 mm diam., dark brown with an indistinct border; coloured margins absent. *Mycelium*

Figs 8-11. Conidia and conidiogenous cells of *Passalora*, *Phaeoisariopsis* and *Pseudocercospora* spp. Fig. 8. *Passalora vicosae* (IACM 3478). Fig. 9. *Phaeoisariopsis luheae* (IACM 4021). Fig. 10. *Pseudocercospora artanthes* (IACM 3606). Fig. 11. *Pseudocercospora bixae* (IACM 1510; scale bar = 10 µm).



internal and external, composed of smooth to finely verruculose, branched, light brown hyphae, 3-4 µm diam. *Caespituli* fasciculate, hypophyllous, brown, up to 150 µm wide and 50 µm high. *Conidiophores* aggregated in dense fascicles, arising from the upper cells of a brown stroma, up to 120 µm wide and 20 µm high; conidiophores light brown, finely verruculose, subcylindrical, straight to geniculate-sinuous, 0-3-septate, 15-30 x 3-4 µm. *Conidiogenous cells* integrated, terminal, light brown, finely verruculose, subcylindrical, tapering to truncate apices with inconspicuous loci, proliferating sympodially, 8-12 x 2-3.5 µm. *Conidia* solitary, olivaceous to pale brown, finely verruculose, guttulate, narrowly obclavate, apex subobtuse, base long obconically truncate, straight to curved, 2-10-septate, 35-110 x 2-3.5 µm; hila inconspicuous.

Specimen: São Paulo, Faculdade de Farmacia, *Piper crassinervium*, 23 Oct. 1940, M. Kuhlmann & H.P. Krug, IACM 3606.

Although we have not seen the Brazilian type specimen of *P. artanthes* (Serra de Cantareira, São Paulo, *Artanthe* sp., A. Puttemans, No. 678, Mar. 1903), the Viégas collection corresponded closely with the description given by Chupp (1954), who also stated that this species is well distributed throughout Brazil.

14. *Pseudocercospora bixae* (Allesch. & F. Noack) Crous, Alfenas & R.W. Barreto comb. nov. Fig. 11

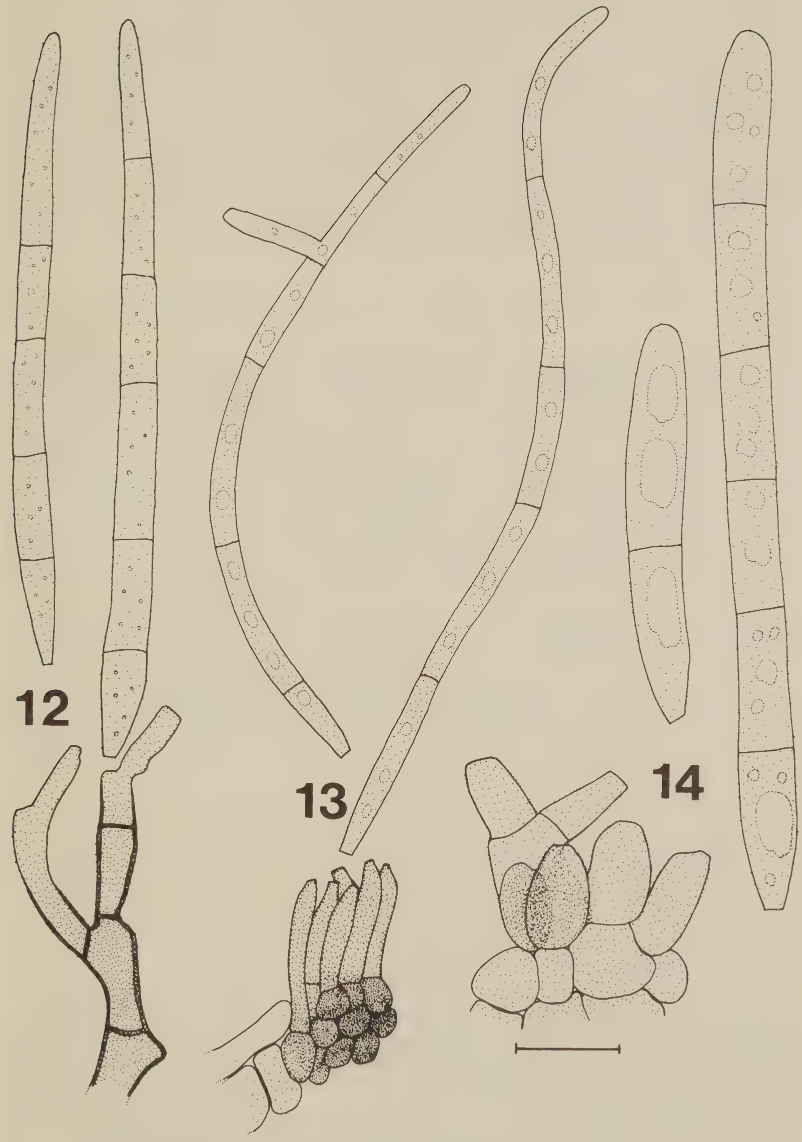
Cercospora bixae Allesch. & F. Noack, *Bot. Inst. Agron. Est. São Paulo em Campinas* **9**, 85. 1898.

Pseudocercospora bixicola Goh & W.H. Hsieh, Cercospora *and similar fungi from Taiwan*, p. 43. 1990.

Leaf spots amphigenous, irregular to sub-circular, 3-15 mm diam., medium brown on the adaxial surface, borders distinct, often slightly raised. *Mycelium* internal, composed of smooth, branched, light brown hyphae, 3-4 µm diam. *Caespituli* fasciculate, amphigenous, dark brown, up to 25 µm wide and 60 µm high. *Conidiophores* aggregated in loose to dense fascicles,

---

Figs 12-14. Conidia and conidiogenous cells of *Pseudocercospora* spp. Fig. 12. *Pseudocercospora micranthae* (IACM 1921). Fig. 13. *Pseudocercospora tibouchinae* (IACM 605). Fig. 14. *Pseudocercospora urenae* (IACM 703; scale bar = 10 µm).



arising from the upper cells of a medium brown stroma, up to 35 µm wide and 60 µm high; conidiophores medium brown, finely verruculose, unbranched, subcylindrical, straight to slightly curved, 1-3-septate, 30-80 x 3-4 µm. *Conidiogenous cells* integrated, terminal, light brown, finely verruculose, subcylindrical, tapering to truncate apices with inconspicuous loci, proliferating sympodially, 17-25 x 3-4 µm. *Conidia* solitary, olivaceous to pale brown, finely verruculose, guttulate, narrowly obclavate, apex subobtuse, base long obconically truncate, straight to slightly curved, 3-10-septate, 30-130 x (2-)3-4 µm; hila inconspicuous.

Specimen: São Paulo, *Bixa orellana*, 26 Apr. 1936, H.P. Krug, IACM 1510.

The type specimen of *P. bixae*, originally described from Brazil (Agron. de Campinas, *Bixa orellana*, F. Noack, Sept. 1897), was not examined in this study. However, the Viégas collection corresponded closely with the description given by Chupp (1954), who reported that this species was widely distributed throughout South America. Viégas described conidia as 30-130 x 3-4 µm, while Chupp reported them as 25-130 x 2-4 µm. Hsieh & Goh (1990) described *P. bixicola* Goh & W.H. Hsieh (conidia 3-6-septate, 30-60 x 2-3 µm), and stated that it was distinguishable from *P. bixae* by having obclavate-cylindrical conidia. However, Viégas (1945) also reported *P. bixae* to have obclavate-cylindrical conidia. The only difference between these species, therefore, is the longer conidia of *P. bixae*. Based on all the other similarities, however, it would be best to treat *P. bixicola* as synonym of *P. bixae*.

15. ***Pseudocercospora micranthae*** (Muller & Chupp) Crous, Alfenas & R.W. Barreto comb. nov. Fig. 12

Cercospora micranthae Muller & Chupp, *Arch. Inst. Biol. Veg. Rio de Janeiro* **3**, 95. 1936.

Mycovellosiella micranthae (Muller & Chupp) Dianese & Furlanetto, *Fitopatol. Bras.* **21**, 406. 1996.

Leaf spots amphigenous, irregular to sub-circular, 2-6 mm diam., medium brown, borders indistinct, margins absent. *Mycelium* internal and external, composed of finely verruculose, branched, light brown hyphae, 4-5 µm diam. *Caespituli* fasciculate, amphigenous, medium brown. *Conidiophores* arising singly from superficial mycelium, or aggregated in loose fascicles, arising from the upper cells of a weakly developed brown stroma; conidiophores medium brown, finely verruculose, branched above, subcylindrical, straight to geniculate-sinuous, 2-6-septate, 40-100 x 3-5 µm. *Conidiogenous cells* integrated, terminal, unbranched, light brown, finely verruculose, subcylindrical, tapering to truncate or subtruncate apices with inconspicuous loci, proliferating sympodially, 10-45 x 3-5 µm. *Conidia* solitary, olivaceous to pale brown, finely verruculose, guttulate, narrowly obclavate, apex subobtuse, base obconically truncate, straight to curved, 4-11-septate, 45-180 x 3.5-6 µm; hila inconspicuous.

Specimen: Minas Gerais, Felipe dos Santos, *Sida cordifolia*, 12 Apr. 1936, H.P. Krug, IACM 1921.

The Brazilian type specimen cited by Chupp (1954) (Minas Gerais, *Sida micrantha*, A.S. Muller & O. Drummond, No. 881, 25 Jan. 1935) was not examined. However, the Viégas material and description correlated closely with that given by Chupp (1954), who referred to this species as occurring in three states in Brazil, namely Espirito Santo, Minas Gerais and São Paulo.

16. *Pseudocercospora punicae* (P. Henn.) Deighton, *Mycol. Pap.* **140**, 151. 1976.

Cercospora punicae P. Henn., *Bot. Jahrb. von Engler* **37**, 165. 1906.
Holomorph: *Mycosphaerella lythracearum* F.A. Wolf, *J. Agr. Res.* **35**, 468. 1927.

Specimen: São Paulo, Campinas, *Punica granatum*, 23 Mar. 1941, A.P. Viégas, IACM 3739.

Chupp (1954) referred to some collections that had catenulate conidia, suggesting that *P. punicae* may be heterogeneous. An examination of the Brazilian collection (IACM 3739) found this feature to be absent, thus being in agreement with Deighton (1976) who allocated it to *Pseudocercospora*. The Viégas collection was characterized by very dense, brown fascicles, and smooth, olivaceous, narrowly obclavate conidia, 2-8-septate, 20-100 x 2.5-5 µm with inconspicuous hila.

17. *Pseudocercospora sawadae* (Yamam.) Goh & W.H. Hsieh, *Trans. Mycol. Soc. R.O.C.* **2**, 117. 1987.

Cercospora sawadae Yamamoto, *J. Soc. Trop. Agric.* **6**, 607. 1934.
Cercospora psidii Sawada, *Dept. Gov. Res. Inst. Taiwan Rept.* **2**, 161. 1922 (non *C. psidii* Rangel).

Specimen: Minas Gerais, Belo Horizonte, Exp. de Agricultura, *Psidium guajava*, 29 May 1940, C.T. de Almeida, IACM 3995.

The Viégas specimen closely corresponded with the description and illustration of the type lodged at NTU-PPE (Hsieh & Goh, 1990).

18. *Pseudocercospora tibouchinae* (Viégas) Deighton, *Trans. Br. Mycol. Soc.* **88**, 391. 1987. Fig. 13

Cercospora tibouchinae Viégas, *Bol. da Soc. Brasil. de Agron.* **8**, 55. 1945.

Cercoseptoria tibouchinae (Viégas) Deighton, *Mycol. Pap.* **140**, 167. 1976.

Leaf spots amphigenous, irregular to sub-circular, 2-3 mm diam., dark brown on the adaxial surface, medium brown on the abaxial surface, with a light brown, raised border; coloured margins absent. *Mycelium* internal, composed of smooth, branched, light brown hyphae, 2.5-3.5 µm diam. *Caespituli* fasciculate to acervular-like, epiphyllous, brown, up to 100 µm wide and 150 µm high. *Conidiophores* aggregated in dense fascicles, arising from the upper cells of brown stroma up to 90 µm wide and 35 µm high; conidiophores mostly reduced to conidiogenous cells. *Conidiogenous cells* terminal, unbranched, light brown, smooth, subcylindrical, straight to slightly curved, tapering to truncate apices with inconspicuous loci, proliferating sympodially, 10-20 x 2-3 µm. *Conidia* solitary, light brown, smooth, guttulate, cylindrical, apex subobtuse, base narrowly obconically truncate, sigmoid, 3-6-septate, 40-120 x 2-3 µm; hila inconspicuous.

Specimen: São Paulo, Faz. Taquaral, Campinas, *Tibouchina* sp., 25 Feb. 1935, H.P. Krug & A.S. Costa, IACM 605 (holotype).

Deighton (1976) did not see the type specimen, but allocated *C. tibouchinae* to *Cercoseptoria* based on Viégas's illustration and description, and later (Deighton, 1987) placed it in *Pseudocercospora*. An examination of the type in the present study found it to be a good species of *Pseudocercospora*, of which *Cercoseptoria* is presently regarded to be a synonym (Deighton, 1987).

19. *Pseudocercospora urenae* (Viégas & Chupp) Hernandez-Guttierrez & Dianese, *Fitopatol. Bras*. **21**, 407. 1996 Fig. 14

Cercospora urenae Viégas & Chupp, *Bol. da Soc. Brasil. de Agron*. **8**, 56. 1945.

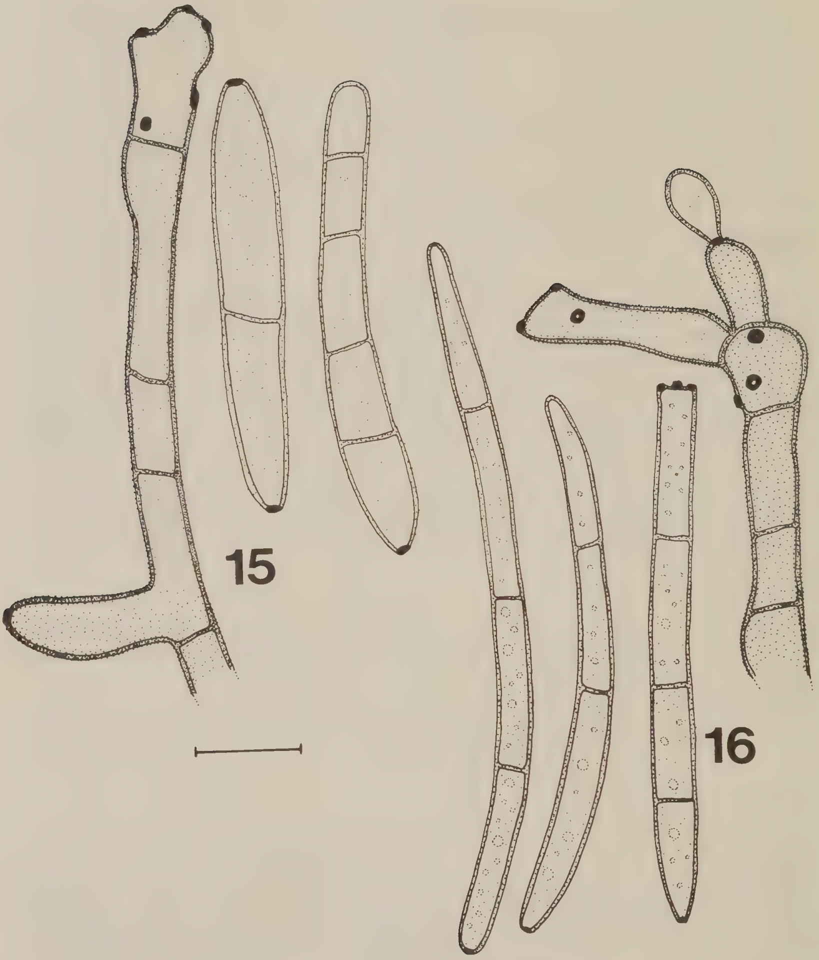
Leaf spots amphigenous, irregular to angular, 1-2 mm diam., medium brown, borders indistinct. *Mycelium* internal and external, composed of finely verruculose, branched, light brown hyphae, 4-6 µm diam. *Caespituli* fasciculate, amphigenous, medium brown. *Conidiophores* arising singly from superficial mycelium, or aggregated in loose fascicles, arising from the upper cells of a poorly developed medium brown stroma; conidiophores frequently reduced to conidiogenous cells, medium brown, finely verruculose, 0-2-septate, subcylindrical, rarely doliiform, straight to geniculate-sinuous, unbranched or branched, 10-75 x 3-7 µm. *Conidiogenous cells* terminal, unbranched, medium brown, finely verruculose, tapering to a rounded apex with inconspicuous loci, proliferating sympodially, 10-15 x 3-6 µm. *Conidia* solitary, light brown, finely verruculose, guttulate, subcylindrical to obclavate-cylindrical, apex obtuse, base obconically truncate, straight to slightly curved, 1-10-septate, 20-120 x 3-8 µm; hila inconspicuous.

Specimen: São Paulo, Campinas, Est. Exp. de Ribeirão Preto, *Urena lobata*, 30 May 1935, H.P. Krug & A.S. Costa, IACM 703 (holotype).

20. *Mycovellosiella peixotoae* (Chupp & Viégas) Furlanetto & Dianese, *Fitopatol. Bras*. **21**, 406. 1996. Fig. 15

Cercospora peixotoae Chupp & Viégas, *Bol. da Soc. Brasil. de Agron*. **8**, 43. 1945.

Leaf spots indistinct, amphigenous, circular, 2-4 mm diam., medium brown on the adaxial surface, margin indistinct, darker brown on the abaxial surface due to brown spore masses. *Mycelium* internal and external, composed of smooth, branched, medium brown hyphae, 4-6 µm diam. *Caespituli* reduced to conidiophores occurring on superficial hyphae, hypophyllous, dark brown, stromata absent. *Conidiophores* arising from superficial hyphae, medium brown, finely verruculose, 1-7-septate, subcylindrical, straight to variously curved, branched below or above, 30-100 x 5-7 µm. *Conidiogenous cells* terminal or lateral, unbranched, medium brown, finely verruculose, subcylindrical, straight to slightly curved, tapering to obtuse



Figs 15, 16. Conidia and conidiogenous cells of *Mycovellosiella* spp. Fig. 15. *Mycovellosiella peixotoae* (IACM 3342). Fig. 16. *Mycovellosiella rubida* (IACM 3742; scale bar = 10 µm).

apices with thickened, darkened loci, proliferating sympodially, 8-35 x 5-9 µm. *Conidia* catenulate, chains simple, olivaceous to pale brown, smooth to finely verruculose, subcylindrical, apex obtuse, base obconically truncate, straight to curved, 1-8-septate, 25-90 x 4-6 µm; hila thickened, darkened, refractive.

Specimen: São Paulo, near São Simão, *Peixotoa macrophylla*, 29 Feb. 1940, A.P. Viégas, IACM 3342 (holotype).

21. *Mycovellosiella rubida* (Muller & Chupp) Crous, Alfenas & R.W. Barreto comb. nov. Fig. 16

Cercospora rubida Muller & Chupp, *Arq. Inst. Biol. Vegetal Rio de Janeiro* **1**, 219. 1935.
Phaeoramularia rubida (Muller & Chupp) Inácio & Dianese, *Fitopatol. Bras.* **21**, 406. 1996.

Leaf spots indistinct, amphigenous, irregular, 1-4 mm diam., pale green on the adaxial surface, medium brown on the abaxial surface with indistinct borders; coloured margins absent. *Mycelium* internal and external, composed of smooth, branched, light brown hyphae, 5-6 µm diam. *Caespituli* fasciculate to non-fasciculate, hypophyllous, medium brown, forming hyphal threads that climb leaf hairs; stromata absent. *Conidiophores* arising singly from superficial hyphae, rarely occurring in loose fascicles, medium brown, finely verruculose, 1-6-septate, subcylindrical, straight to variously curved, branched below or above, 10-80 x 4-6 µm. *Conidiogenous cells* terminal or lateral, medium to light brown, finely verruculose, subcylindrical, apices clavate with thickened, darkened loci, proliferating sympodially, 10-35 x 4-6 µm. *Conidia* catenulate, chains simple or branched, light to medium brown, smooth, granular to guttulate, cylindrical, apex subobtuse, base long obconically truncate or rounded, straight to slightly curved, 2-13-septate, 25-170 x 4-6 µm; hila thickened, darkened, refractive.

Specimen: Minas Gerais, Viçosa-Escola, *Croton floribundus*, 29 Apr. 1933, A.S. Muller, IACM 3742 (holotype). Chupp (1954) referred to the type as No. 503, and Viégas (1945) noted that a part of the type (isotype?) was designated as Fungi from Minas Gerais No. 503.

22. Mycosphaerella eugenicola Crous, Alfenas & R.W. Barreto sp. nov. Fig. 17

Anamorph: ***Pseudocercospora sphaerellae-eugeniae*** (Sacc.) Crous, Alfenas & R.W. Barreto comb. nov.

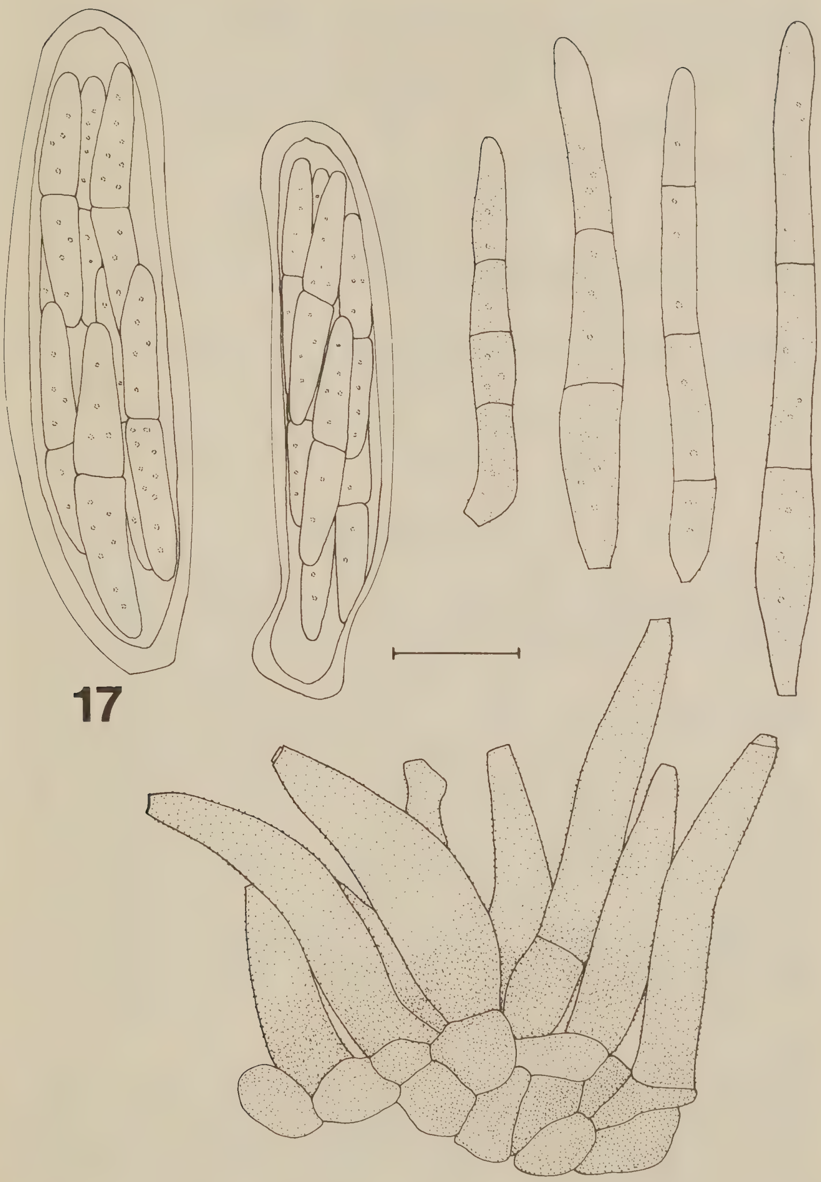
Cercosporina sphaerellae eugeniae (Rangel) Sacc., *Syll. Fung*. **25**: 912. 1931.
Cercospora eugeniae Sawada, *Formosa Agr. Res. Inst. Rept*. **85**, 104. 1943. nom. illegit.
Cercospora eugeniae Chupp, *Bol. da Soc. Brasil. de Agron*. **8**, 25-26. 1945.
Cercospora eugeniae (Rangel) Chupp, *A monograph of the fungus genus* Cercospora, p. 406. 1954.
Cercospora eugeniae (Rangel) Chantarasrikul & Puckdeedindan, *FAO Plant Protection Committee for SE Asia & Pacific Region, Technical Document* **72**, 15. 1969.

Laesiones amphigenae, irregulares ad suborbiculares, 2-5 mm diam, medio brunneae. Pseudothecia hypophylla, nigra, subepidermalia, globosa, 80-100 µm diam. Asci fasciculati, bitunicati, late ellipsoidei ad cylindracei, recti vel parum incurvati, 8-sporis, 35-45 x 9-13 µm. Ascosporae multi-seriatae, imbricatae, hyalinae, guttulatae, parietibus tenuibus, rectae ad parum curvatae, fusoideo-ellipsoideae, base obtusa et apice obtuso, mediano 1-septatae, ad septum constrictae, 20-28 x 3.5-4 µm.

Leaf spots amphigenous, irregular to sub-circular, 2-5 mm diam., medium brown with raised borders and red-brown margins. *Pseudothecia* hypophyllous, black, subepidermal, becoming erumpent, globose, 80-100 µm wide; apical ostiole 10-15 µm diam.; wall consisting of 3-4 layers of medium brown *textura angularis*. *Asci* aparaphysate, fasciculate, bitunicate, subsessile, broadly ellipsoid to cylindrical, straight to incurved, 8-spored, 35-45 x 9-13 µm. *Ascospores* multi-seriate, overlapping, hyaline, guttulate, thin-walled, straight to slightly curved, fusoid-ellipsoidal with narrowly subobtuse ends, widest at septum, medianly 1-septate, constricted at septum, tapering towards both apices, 20-28 x 3.5-4 µm. *Mycelium* internal, composed of smooth, branched, light brown hyphae up to 4 µm diam. *Caespituli* fasciculate, hypophyllous, brown, situated on the upper cells of erumpent, substomatal pseudothecia. *Conidiophores* aggregated in loose fascicles, medium brown,

---

Fig. 17. Asci, conidia and conidiophores of *Mycosphaerella eugenicola* and its anamorph *Pseudocercospora sphaerellae-eugeniae* (IACM 2997; scale bar = 10 µm).



17

becoming lighter brown near the apex, finely verruculose, 0-2-septate, subcylindrical, straight to slightly curved, unbranched, 30-70 x 4-7 µm. *Conidiogenous cells* terminal, unbranched, light brown, finely verruculose, subcylindrical, straight to slightly curved, tapering to truncate apices with inconspicuous loci, proliferating sympodially, 20-45 x 4-6 µm. *Conidia* solitary, medium to light brown, finely verruculose, guttulate, subcylindrical to narrowly obclavate, apex obtuse, base obconically truncate, straight to slightly curved, 1-3-septate, 30-90 x 2-5 µm; hila unthickened, inconspicuous, 2 µm wide.

Specimen: Cabo Frio, Est. Rio De Janeiro, *Eugenia uniflora*, 16 Oct. 1938, A.P. Viégas & H.P. Krug, IACM 2997 (holotype of teleomorph).

The taxonomy of this species is very confusing. Rangel (1916), cited a type specimen collected from *Eugenia uniflora* (Paqueta prope Rio de Janeiro, exs. 1020, Dec. 1913), and described a *Cercospora* sp. as the conidial state of *Mycosphaerella eugeniae* Rehm. Although a type was designated and a Latin description provided, no name was given for the anamorph. Saccardo (1931) validated it with the name *Cercosporina sphaerellae eugeniae* (Rangel) Sacc. Two combinations were subsequently proposed in *Cercospora* based on the original description, namely *Cercospora eugeniae* (Rangel) Chupp (Viégas, 1945; Chupp, 1954) and *Cercospora eugeniae* (Rangel) Chantarasrikul & Puckdeedindan (1969). Hsieh & Goh (1990) stated that the type specimen of *Cercospora eugeniae* Sawada (nom. illegit., no Latin) (Herb. NTU-PPE, May 1931, Yuching Taiwan Hsien, K. Sawada) was depauperate, but based on the illustation and original description given by Sawada, it should be seen as synonym of *C. eugeniae* (Rangel) Chupp (loc. cit.), which in all probablility represented a *Pseudocercospora* sp. Although we have not located the Rangel type specimen in the present study, the Viégas specimen closely resembled the type description in symptomatology and morphology.

The specimen collected by Viégas (IACM 3342) has fascicles situated on top of erumpent pseudothecia. This is in agreement with the observations of Rangel (1916) who linked this anamorph to *Mycosphaerella eugeniae* Rehm. However, ascospores of the present collection were 20-28 x 3.5-4 µm, which were larger than those of *M. eugeniae* Rehm (15-17 x 2-2.5 µm), *M.*

aequatoriensis Petrak (12-23 x 3-4 µm), and *M. vexans* (Massee) Tomilin (8-9 x 3 µm) (Corlett, 1991). A new species of *Mycosphaerella*, *M. eugenicola*, is therefore described as the teleomorh of *P. sphaerellae-eugeniae*.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge the assistance of the curator of IACM for providing the specimens that formed the basis of this study. The Department of Plant Pathology/Bioagro at the Federal University of Viçosa is thanked for providing laboratory facilities to the first author during a recent visit to Brazil, and Dr Uwe Braun (Martin Luther Univ., Halle, Germany) is thanked for reviewing the script.

REFERENCES

Barreto, R.W. & Evans, H.C. 1995. The mycobiota of the weed *Mikania micrantha* in southern Brazil with particular reference to fungal pathogens for biological control. *Mycological Research* **99**, 343-352.

Braun, U. 1995. Miscellaneous notes on Phytopathogenic Hyphomycetes (II). *Mycotaxon* **55**, 223-241.

Chupp, C. 1954. A monograph of the fungus genus *Cercospora*. Ithaca, New York. Published by the author.

Corlett, M. 1991. An annotated list of the published names in *Mycosphaerella* and *Sphaerella*. *Mycologia Memoir* **18**, 1-328.

Crous, P.W. & Alfenas, A.C. 1995. *Mycosphaerella gracilis* sp. nov. and other species of *Mycosphaerella* associated with leaf spots of *Eucalyptus* in Indonesia. *Mycologia* **87**, 121-126.

Crous, P.W. & Braun, U. 1995. *Cercospora* species and similar fungi of South Africa. *Mycological Research* **99**, 31-36.

Crous, P.W. & Braun, U. 1996. Cercosporoid fungi from South Africa. *Mycotaxon* **57**, 233-321.

Deighton, F.C. 1976. Studies on *Cercospora* and allied genera. 6. *Pseudocercospora* Speg., *Pantospora* Cif. and *Cercoseptoria* Petr. *Mycological Papers* **140**, 1-168.

Deighton, F.C. 1987. New species of *Pseudocercospora* and *Mycovellosiella*, and new combinations into *Pseudocercospora* and *Phaeoramularia*. *Transactions of the British Mycological Society* **88**, 365-391.

Dianese, J.C. & Câmara, M.P.S. 1994. *Pseudocercospora aspidospermatis* - a new combination for *Bactrodesmiella aspidospermatis*. *Sydowia* **46**, 225-232.

Dianese, J.C., Sutton, B.C. & Tessman, D.J. 1993. Two deuteromycetes, *Phloeosporella flavio-moralis* sp. nov. and *Pseudocercospora punctata* comb. nov., causing leaf lesions on *Eugenia* spp. *Mycological Research* **97**, 123-126.

Ellis, M.B. 1976. More dematiaceous hyphomycetes. International Mycological Institute, Surrey, England.

Hsieh, W.H. & Goh, T.K. 1990. *Cercospora* and similar fungi from Taiwan. Maw Chang Book Company, Taipei, Taiwan, Republic of China.

Inácio, C.A., Furlanetto, C., Hernandez-Gutierrez, A. & Dianese, J.C. 1996. Some *Cercospora* species originally described by Ahmés Pinto Viégas. *Fitopatologia Brasileira* **21**, 405-409.

Medeiros, R.B. & Dianese, J.C. 1994. *Passalora eitenii* sp. nov. on *Syagrus comosa* in Brazil and a key to *Passalora* species. *Mycotaxon* **51**, 509-513.

Morris, M.J. & Crous, P.W. 1994. New and interesting records of South African fungi. 14. Cercosporoid fungi from weeds. *South African Journal of Botany* **60**, 325-332.

Rangel, E. 1916. Fungos do Brasil, novo ou mal conhecidos por *Eugenia* Rangel. *Archivos do Museum Nacional Rio de Janeiro* **18**, 157-164.

Saccardo, P.A. 1931. *Sylloge Fungorum* **25**, 1-1093.

Sawada, K. 1943. Descriptive catalogue of the Formosan fungi. VIII. *Taiwan Agricultural Research Institute Report* **85**, 98-126.

Sutton, B.C. & Crous, P.W. 1996. *Lecanostictopsis* gen. nov. and similar fungi from *Syzygium cordatum*. *Mycological Research* **100**, In press.

Viégas, A.P. (1945). Alguns fungos do Brasil - Cercosporae. *Boletim da Sociedade Brasileira de Agronomia* **8**, 1-160.

MYCOTAXON

Volume LXIV, pp. 431-435 September 1997

NATS TRUFFLE AND TRUFFLE-LIKE FUNGI 6: *STEPHENSIA BYNUMII* SP. NOV. (ASCOMYCOTA), WITH A KEY TO THE SPECIES OF *STEPHENSIA*

JAMES M. TRAPPE
Department of Forest Science, Oregon State University,
Corvallis, Oregon 97331-7501

WELLES BUSHNELL
North American Truffling Society, Box 296,
Corvallis, Oregon 97339-0296

MICHAEL A. CASTELLANO
U. S. Department of Agriculture, Forest Service, Pacific Northwest Research
Station, Forestry Sciences Laboratory, Corvallis Oregon 97331

ABSTRACT

A new truffle species, *Stephensia bynumii,* related to the Otidiaceae of the Pezizales, is described as endemic to the Willamette Valley of northwestern Oregon. A world key to the six species of *Stephensia* is presented.

INTRODUCTION

The genus *Stephensia* has six species; only *S. shanori* (Gilkey) Gilkey, has been reported from the U.S.A. (Gilkey, 1961). *S. bombycina* (Vittad.) Tul. & C. Tul., has been found in Mexico (Trappe #3268, unpublished data). Another, undescribed species was collected several times by Otis Bynum on his property in the central Willamette Valley of Oregon. It has since been found elsewhere in the Willamette Valley, where it apparently is a local endemic.

METHODS

Methods of collecting and macroscopic and microscopic study were generally those of Castellano *et al.* (1989). Colors of fresh specimens are in general terms. Hand-cut sections of both fresh and dried material were mounted in water, 5% KOH, Melzer's reagent, or cotton blue for standard light microscopy. Measurements of structures are from mature specimens. Spores were measured in water mounts, because other reagents may cause spores to either shrink or swell (N. S. Weber, personal communication). Other structures were measured in KOH mounts. Photomicrographs are from material mounted in 5% KOH or from thin sections stained with safranin and fast green. All specimens are deposited in the Mycological Herbarium of Oregon State University (OSC).

TAXONOMY

Stephensia bynumii Trappe, Bushnell & Castellano, sp. nov. Fig. 1

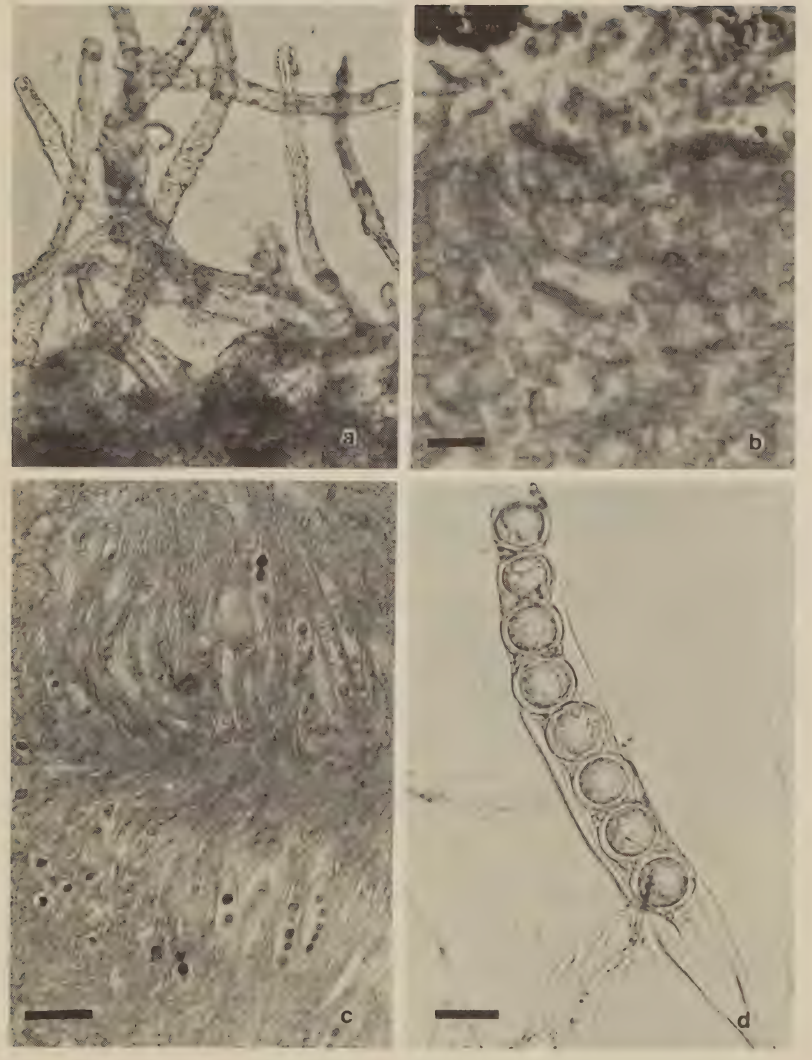
Ascomata subglobosa vel convoluta, 10-20 x 15-23 µm, juventute pallide avellanea, maturitate tomento brunneo tecta. Gleba solida, cremea, venis gilvis hymenialibus. Sporae globosae, bulla gaseosa, 16-18 (-21) µm i diam, hyalinae, laeves. Asci (6-) 8 spori, juventute clavati vel saccati, maturitate cylindracei, 238-250 x 18-20 µm caulem deminutum 45-60 µm longum includentia. Paraphyses tenus ascis, 2-3 µm in diam, hyalinae, septatae. Tomentum hypharum 4-8 µm in diam, granulatarum. Excipulum externum textura intricata laxa cellulis frequentibus inflatis usque ad 10-20 (-40) µm; excipulum internum similare, arctius. HOLOTYPUS leg. O. Bynum, Trappe #5832.

Ascomata hypogeous, subglobose and shallowly furrowed to much lobed and convoluted, 10-20 x 15-23 mm, in youth pale yellowish brown with a scattered brown tomentum, soon covered with a brown to dark brown tomentum, sometimes cracked to reveal the cream-colored underlying tissues. **Gleba** solid, white to cream color, incorporating short, pale pinkish brown to pale brownish orange veins 0.5-1 mm broad packed with opposing hymenia of asci and paraphyses. **Odor and taste** not distinctive.

Peridial tomentum of septate, brownish yellow hyphae 4-6 (-8) µm in diam, the walls thin or up to 0.5 µm thick, soon covered with hyaline to pale yellow granules up to 1 µm tall. **Ectal excipulum (peridial epicutis)** 50-150 µm thick, a loose *textura intricata* of interwoven hyphae 4-9 µm in diam at septa, with frequent cells or chains of cells inflated to 10-20 (-40) µm, the walls hyaline to yellow and thin or up to 0.5 µm thick. **Ental excipulum (peridial subcutis)** similar to ectal excipulum except of more tightly interwoven and of hyaline, thin-walled hyphae.

Medullary excipulum (gleba) of tightly interwoven, hyaline, thin-walled hyphae (2-) 4-7 µm in diam at septa, the cells not or only slightly inflated. **Subhymenium** similar to medullary excipulum but lacking inflated cells. **Asci** (6-) 8 spored, in youth clavate to saccate with uniseriate or biseriate spores, by maturity cylindric with uniseriate spores and 230-250 x 18-25 µm including a tapering stem 45-60 µm long with a forked base, one arm of the fork usually longer than the other, nonamyloid. **Paraphyses** about as long as or slightly exceeding the asci, 2-3.5 µm in diam, hyaline, septate, sometimes branched, the tips rounded and straight.

Fig. 1. Photomicrographs of *Stephensia bynumii*. a. Granule-encrusted hyphae of the peridial surface tomentum, bar = 10 µm; b) a cross-section of the peridium showing the loose tomentum on surface and epicutis of interwoven hyphae and inflated cells, x 400, bar = 20 µm; c) a cross-section of the gleba showing a vein lined with a hymenium of asci and paraphyses that grow beyond the hymenium to stuff the vein, x 150, bar = 40 µm; d) a single ascus containing 8 ascospores, bar = 20 µm.


a
b
c
d

Spores globose, 16-18 (-21) µm in diam (spores in KOH mounts often somewhat larger), hyaline, smooth, the wall at maturity 0.5 µm thick; spores not staining in cotton blue, hyaline to pale yellow in Melzer's reagent.

Etymology: in honor of Otis Bynum, the collector of the holotype and most of the paratypes.

Collections examined: HOLOTYPE—**OREGON: Marion Co.:** Turner, Marion Hill, 4754 Marion Hill Road, leg. Otis Bynum, Trappe #5832, June 1980 (OSC 58834). PARATYPES—**Clackamas Co.:** Beaver Cr., Paul Bishop Tree Farm, leg. Dan Wheeler, Trappe #9004, 15 Aug. 1986 and Trappe #9574, 26 July 1987 (OSC 58840, 58841). **Marion Co.:** Turner, Marion Hill, leg. Otis Bynum, Trappe #5855, 28 June, 1980; Trappe #5868, 10 July 1980; Trappe #5884, 26 July 1980; Trappe #5942, 2 Aug. 1980 (OSC 58835, 58836, 58837, 58838); junction of Waconda rd. and Howell Prairie rd., leg. Welles Bushnell, Trappe #8881, 9 April 1986 (OSC 58839).

Habitat and season: a probable mycorrhizal associate with *Pseudotsuga menziesii* and *Corylus cornuta* var. *californica* below 200 m elevation in the Willamette Valley of Oregon, April through August.

Discussion: *Stephensia bynumi* has spores 16-18 (-20) µm in diameter but otherwise resembles the type of the genus, *S. bombycina* , which has spores (18-) 20-25 (-27) µm in diam. *Stephensia shanori* has spores 13-17 µm in diameter and only a very sparse tomentum in furrows or near the base of the ascomata.

Stephensia was assigned to the Pyronemataceae, tribe Mycolachneae (Trappe, 1979) but now is placed in the Otidiaceae. In the phylogenetic progression from brown tomentose cup fungi to solid truffles, it is intermediate between *Geopora* and *Phaeangium.* *Geopora* includes species with hymenium-lined cups or chambers and forcible spore discharge (Burdsall, 1968). *Stephensia* species retain vestigial hymenia, but these are embedded in solid tissue that precludes spore discharge. The single *Phaeangium* sp., *P. lefebvrei* Pat., has lost the hymenium and instead has asci randomly placed in pockets embedded in solid tissue (Alsheikh and Trappe, 1983).

A WORLD KEY TO THE SPECIES OF *STEPHENSIA*

1. Spores ellipsoid, often twice as long as broad .... *S. peyronelii* Mattirolo
1. Spores globose to subglobose.. 2

    2. Spores at maturity mostly > 20 µm in diameter...................... *S. bombycina*
    2. Spores at maturity mostly < 20 µm in diameter.. 3

3. Spores 12-15 µm in diameter; Australia .... *S. arenivaga* Cooke & Massee
3. Spores 15-20 (-23) µm in diameter; Indonesia or North America 4

4. Most asci with 1-4 spores; Illinois .... *S. shanori*
4. Most asci with 5-8 spores; Sumatra or Oregon.. 5

5. Nearly all asci with 8 spores; Oregon .... *S. bynumi*
5. Asci often with 5-7 spores; Sumatra .... *S. sumatrana* Boedijn

ACKNOWLEDGEMENTS

This series is a project of the North American Truffling Society (NATS). The research was supported in part by National Science Foundation Grants DEB 9007186 and 9400545.

Literature cited

Alsheikh, A.M. and Trappe, J. M. 1983. Taxonomy of *Phaeangium lefebvrei,* a desert truffle eaten by birds. Can. J. Bot. 61: 1919-1925.

Burdsall, H. H., Jr. 1968. A revision of the genus *Hydnocystis* (Tuberales) and of the hypogeous species of *Geopora* (Pezizales). Mycologia 60: 496-525.

Castellano, M. A., Trappe, J. M., Maser, Z. and Maser C. 1989. *Keys to Spores of the Genera of Hypogeous Fungi of North Temperate Forests with Special Reference to Animal Mycophagy.* Mad River Press, Eureka, CA. 186 pp.

Gilkey, H. M. 1961. New species and revisions in the order Tuberales. Mycologia 53: 215-220.

Trappe, J. M. 1979. The orders, families, and genera of hypogeous Ascomycotina (truffles and their relatives). Mycotaxon 9: 297-340.

MYCOTAXON

Volume LXIV, pp. 437-441 September 1997

NATS TRUFFLE AND TRUFFLE-LIKE FUNGI 7: *TUBER ANNIAE* SP. NOV. (ASCOMYCOTA)

Wes Colgan III and James M. Trappe
Department of Forest Science, Oregon State University,
Corvallis, Oregon 97331-7501

ABSTRACT

A new truffle species associated with *Pseudotsuga menziesii* in western Oregon and Washington is described as *Tuber anniae*. It differs from related species, *T. monticola* and *T. shearii,* in peridial color and spore shape and ornamentation.

INTRODUCTION

Integrated research on the northern spotted owl in forests of 55 to 65-yr-old *Pseudotsuga menziesii* at Fort Lewis Military Reservation near Olympia, Washington, includes studies of the small mammals that constitute the owls' food base. Because hypogeous fungi are a major food base for the small mammals, standing crops of those fungi have been monitored at 6-week intervals for nearly 3 years (Colgan *et al.* 1996). During this time, the genus *Tuber* was represented by three species: *T. monticola* Harkness was relatively common, *T. gibbosum* Harkness was found once, and an undescribed *Tuber* sp. was represented by 4 collections. We propose the name *Tuber anniae* for this new taxon.

The relationship of the new species to *Tuber shearii* Harkness prompted us to re-examine herbarium collections tentatively assigned to that species but not comfortably fitting its characters. As a result, additional collections of *T. anniae* were found, extending its range south to Northwestern Oregon .

METHODS

At each collecting time, 10 plots of 4 m^2 each were raked into mineral soil along each of 16 transects. All specimens found in plots were collected, dried and identified Specimens were then weighed to estimate standing crops (Colgan *et al.* 1996). Colors of fresh specimens are in general terms of the authors. Specimens were dried the day of collection with a forced air dehydrator set at 49°C (120°F). Microscopic characters were determined from hand sections mounted in 5% KOH, Melzer's reagent, or cotton blue, as indicated. Spore dimensions are based on at least 50 randomly selected spores and do not include ornamentation. The light photomicrograph is from material mounted in 5% KOH. For scanning electron microscopy, dried spores were mounted on pegs with double sided tape, coated with gold and examined with an Amray 3000 scanning electron microscope. The holotype and paratypes have been accessioned into the Mycological Herbarium of Oregon State University (OSC).

TAXONOMY

Tuber anniae Colgan & Trappe, sp. nov. Fig. 1

Ascomata 6-18 mm in diam, subglobosa vel irregularia, glabra, brunnea vel obscure olivaceobrunnea. Gleba atrobrunnea venis albis et brunneogriseis marmorata. Sporae pro parte maxima globosae et 20-45 µm in diam, ubi subglobosae vel late ellipsoideae 25-48 (-50) x 20-44 µm, brunneae, reticulatae alveolis 6-10 per longitudinem sporae. Asci 75-90 x 50-80 µm, globosi vel ellipsoides, hyalini. Holotypus: OSC 58992.

Ascomata subglobose to irregular, 6-18 mm in diam, glabrous, in youth pale yellow, by maturity brown to dark olive brown with grayish white furrows and patches, crisp, drying hard. **Gleba** at maturity with dark brown fertile tissue marbled with narrow, white to ivory veins alternating with brownish gray veins. **Odor** mild to slightly paint-like; **taste** not recorded.

Peridium 100-200 µm thick, with two layers. **Ectal excipulum** (40-) 75-120 µm thick, a compact tissue of isodiametric to elongate, rounded or subangular, hyaline to light yellow cells 3-20 µm in diam, the walls 0.2-1 µm thick. **Ental excipulum** 25-80 µm

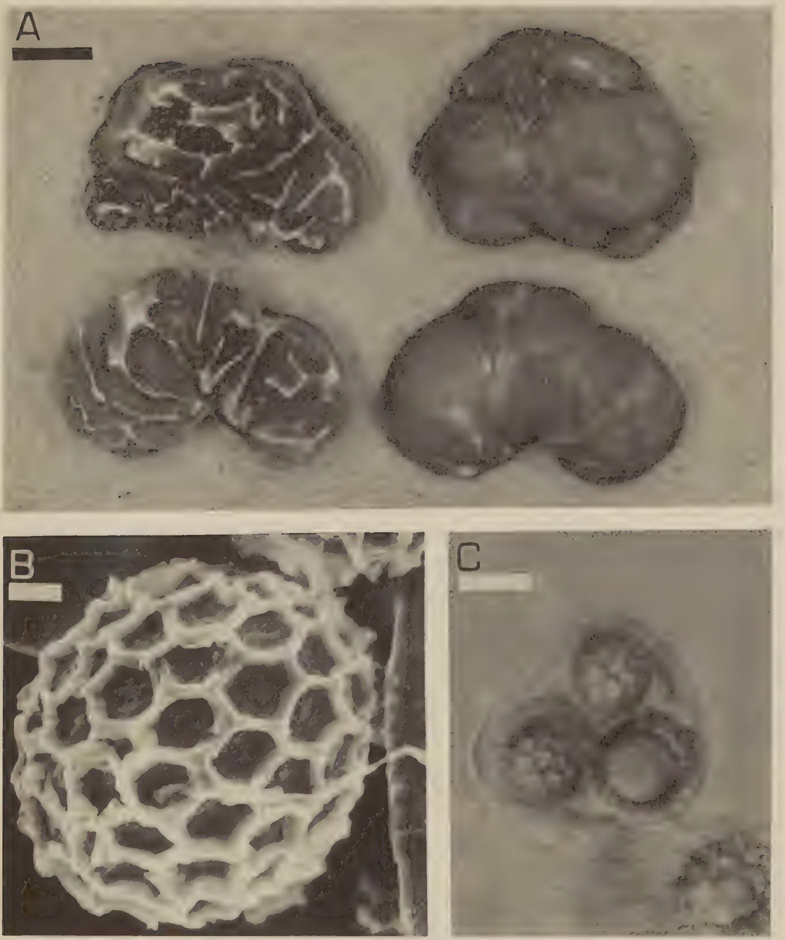


Fig. 1. *Tuber anniae.* A. Ascomata: left, cross section; right, surface view. Scale bar 5 mm (OSC 58992). B. Scanning electron micrograph of spore. Scale bar 2 µm (OSC 58992). C. Light microscope micrograph of ascus with spores. Scale bar 20 µm (OSC 58992).

thick, hyaline, of tightly periclinal-interwoven, hyaline hyphae 2-4 µm broad at the septa, the cells often slightly inflated, the walls thin to somewhat thickened.

Medullary excipulum (gleba) of hyaline, interwoven, thin-walled, hyphae 2-5 µm broad with scattered cells inflated up to 10 µm. **Asci** 1-4 spored, crowded within the medullary excipulum, globose to ellipsoid, 75-90 x 50-80 µm, hyaline, the walls ±1 (-2) µm thick, lacking a stem or occasionally with a simple stem 8-20 µm long.

Spores globose to subglobose or infrequently broadly ellipsoid, brown, the walls up to 5 µm thick at maturity; in 1-spored asci 43-45 µm in diam excluding ornamentation when globose, 45-48 (-50) x 40-44 µm when ellipsoid; in 2-spored asci mostly globose and 28-45 µm in diam; in 3-spored asci mostly globose and 25-38 µm in diam; in 4-spored asci mostly globose and 20-25 µm in diam. Ornamentation alveolate, the alveolae 6-10 along the spore and with 5-6 sides, the alveolar walls 3-5 µm tall and yellow brown to dark brown in KOH and Melzer's reagent. Lens effect often prominent on larger spores (in transmitted light the alveolae on the underside of the spore are projected to the upper spore surface).

Etymology: "*anniae*" in honor of Annie Kiel, who facilitated the Fort Lewis Ecosystem Study in many useful ways.

Collection examined: HOLOTYPE - **Washington:** *Thurston Co.*, Fort Lewis Military Reservation, Star Forest Block, light thinning treatment area 03, plot 25, 3 Nov. 1993, D. Thysell (OSC 58992). PARATYPES - **Oregon:** *Linn Co.,* Wiley Cr., 12 Dec. 1990, N. S. Weber (OSC 59335); *Polk Co.,* Black Rock Rd., 5 Oct. 1996, A. Beyerle (OSC 59329). **Washington:** *Lewis Co.,* 1 mi. N. of Vader, 10 July 1969, J. Trappe (OSC 59328); *Thurston Co.,* Fort Lewis Military Reservation, Farley Forest Block, nonthinned stand 04, plot 18, 16 Aug. 1993, W. Colgan III (OSC 58991); Star Forest Block, nonthinned stand 02, plot 100, 31 Aug. 1995, W. Colgan III (OSC 59000); Star Forest Block, light thinning treatment area 01, plot 115, 24 Oct. 1993, J. Trappe (OSC 59001).

Habit, Habitat and Season: Hypogeous, 200-800 ft elevation in 50 to 70-yr.-old stands of *Pseudotsuga menziesii*, with which it probably forms ectomycorrhizae. August through December. The August and October collections are not fully mature, so we infer that ascomata begin to form in late summer and mature in late autumn.

Discussion: *Tuber anniae* is intermediate between *T. monticola* Harkness and *Tuber shearii* Harkness. *T. anniae* has a brown to dark olive brown peridium and mostly globose spores with 6-10 alveolae across the spore surface. *T. monticola* has a dingy white to gray peridium and mostly globose spores with (8) 10-16 alveolae across the spore surface. *T. shearii* has a light yellowish brown peridium and mostly subglobose to broadly ellipsoid spores with 2-8 alveolae lengthwise along the spore surface. The anatomy of the peridium and gleba is similar among all three species, although *T. shearii* has areas of obtuse to tapered, often granulated hyphae emergent from the surface. At present, *T. anniae* and *T. monticola* are reported only from the Pacific Coast, whereas *T. shearii* has been reported only from east of the Mississippi (Gilkey 1954). *Tuber sphaerosporum* Gilkey and *Tuber californicum* Harkness differ from *T. anniae* in having uniformly globose spores.

ACKNOWLEDGMENTS

This research was conducted under grants, contracts, and agreements to Andrew B. Carey, Leader, Ecological Foundations of Biodiversity Team and Randy Molina, Leader, Forest Mycology Team, from the USDA Forest Service. Specifically, funding was provided by the U.S. Army, Fort Lewis Military Reservation, the USDA National Research Initiative Competitive Grants Program (Grant No. 9401095) and the USDA Forest Service, Pacific Northwest Research Station. National Science Foundation Grants DEB 9007186 and 9400545 also provided funding for the second author. Adrian Beyerle and Nancy S. Weber of the North American Truffling Society kindly provided their collections of the new species. This is Paper 3201 of the Forest Research Laboratory, Oregon State University.

LITERATURE CITED

Colgan III, W., J. Trappe, R. Molina, A. B. Carey & D. Thysell. 1996. Production of hypogeous fungal sporocarps in a variably thinned Douglas-fir forest. *In* C. Azcon-Aguilar & J. M. Barea (eds.), *Mycorrhizas in Integrated Systems from Genes to Plant Development.* European Commission Directorate-General XII Science, Research and Development, Brussels. pp. 85.

Gilkey, H. M. 1954. Tuberales. North American Flora II, 1:1-36.

MYCOTAXON

Volume LXIV pp. 443-448 September 1997

FIRST REPORT OF *GASTROSPORIUM SIMPLEX* (GASTEROMYCETES) FROM SOUTH AMERICA

LAURA S. DOMINGUEZ DE TOLEDO
Instituto Multidisciplinario de Biologia Vegetal
Universidad Nacional de Córdoba - Casilla de Correo 495
5000 - CORDOBA - Argentina
and
MICHAEL A. CASTELLANO
United States Department of Agriculture, Forest Service, Pacific Northwest
Research Station, Forestry Sciences Laboratory,
Corvallis, Oregon 97331

This paper is a portion of extensive studies to re-examine the Gasteromycete mycota of Central Argentina (Domínguez de Toledo, **1989**, **1993**, **1994**).

On a 1991 trip to the eastern side of the Sierras Grandes de Córdoba in search of truffle-like fungi, the senior author collected specimens that appeared to be an immature Gasteromycete. Further study revealed them to be the genus *Gastrosporium*.

The monotypic genus *Gastrosporium* is based on *G. simplex* Matt., originally described from Italy (Mattirolo, **1903**). It is known from the Mediterranean and central and northern Europe (Pilát, **1934**, **1958**; Bugnon & Petitberghien, **1949**; Rauschert, **1956**; Henning, **1971**; Winterhoff, **1974**; Dring, **1973** and Kers, **1980**). Ahmad (**1950**, **1952**) reported it growing near Panjab in Pakistan and Miller & Askew (**1982**) in western Canada and the United States.

The ontogeny, morphology, and ecology of this fungus have been well studied (Pilát, **1934**, **1958**, Monthoux and Röllin, **1976**). These studies led to placement of this genus in the new family Gastrosporiaceae, (Pilát, **1934**). Monthoux (**1977**) studied the nature of the crystals abounding in the cortex of the well-developed rhizomorphs and the exoperidium and concluded they were quartz. We have expanded the spore description to include spore symmetry, length/width ratio (E), mean of E values (Q), and reaction to Melzer's reagent and cotton blue.

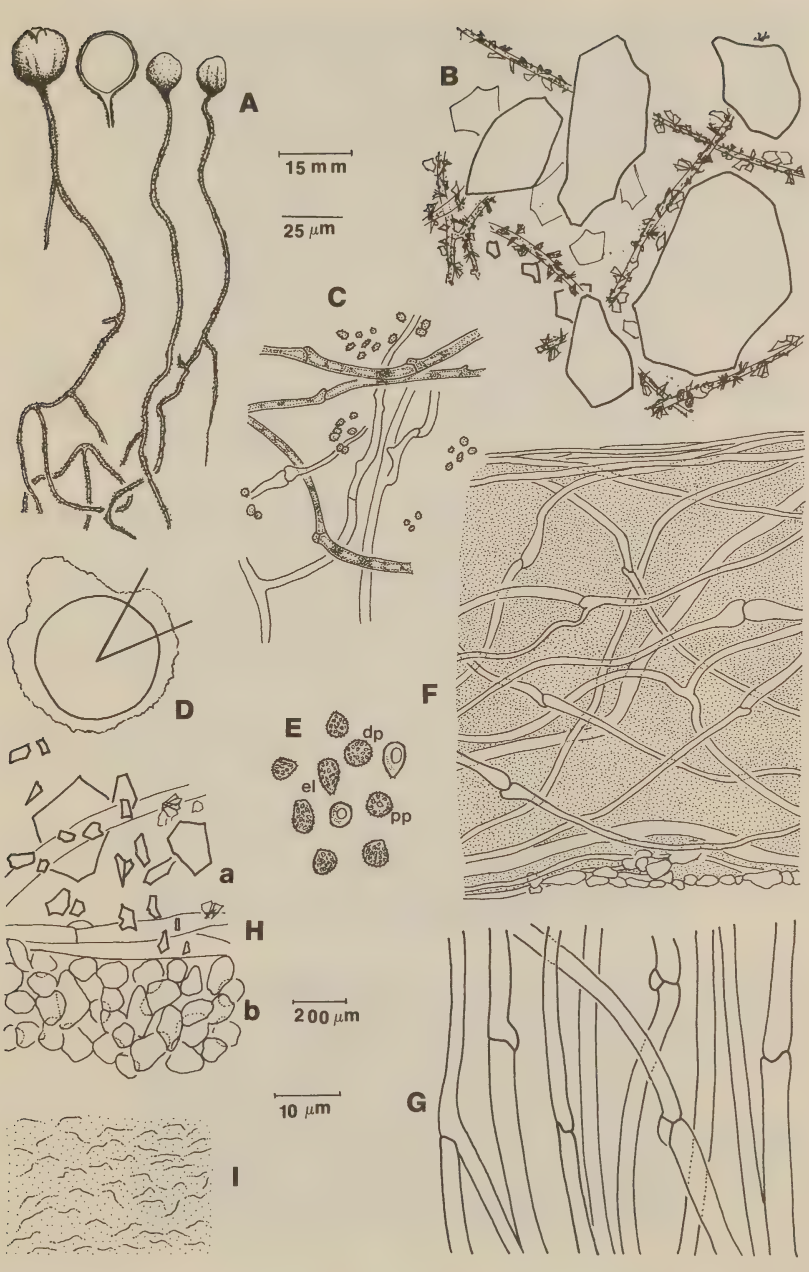
Freehand sections of dried material were mounted for microscopic observation in water, Melzer's reagent, 3% KOH, or cotton blue in lactic acid. Spore size were measured in water and includes ornamentation. Number of spores measured for calculating mean size (x) and the length/width ratio (E) are included in brackets [ ]; x = the arithmetic mean of spore length and width ± standard deviation; Q = the mean of E values ± standard deviation. Drawings were made with the aid of a camera lucida. Color names and numbers are cited from Kelly and Judd (**1955**). A SEM was used to study spore ornamentation. The specimens were coated with gold-palladium under vacuum and observed in an Amray 1000 scanning electron microscope at 15-40 kv. Photographs were taken using black and white, 4 x 5, Polaroid Type 55 film. The description is based on Argentian specimens.

Gastrosporium simplex Mattirolo, Mem. Reale Accad. Sci. Torino, ser. 2, 53:361, 1903.

= *Leucorrhizon nidificum* Velenovsky, Mycologia 2:50, 1925.
= *Gastrosporium beccarianum* Lloyd, Mycol. Writ. 7:1265, 1924.
= *Calvatia defodiodis* Lloyd, Mycol. Writ. 4 (Letter 44):8, 1913.
= *Disciseda defodiodis* (Lloyd) Zeller, Mycologia 39:308, 1947.

Sporocarps globose to subglobose, up to 1 cm in diam, white, cracking irregularly at maturity, with conspicuous rhizomorphs, (Fig. 1:A); surface covered with adherent sand which gives the surface a pulverulent nature. **Gleba** powdery, initially white then pale brown to yellow olive brown (ISCC-NBS 89-90), without sterile tissue. **Rhizomorph** well-developed, branched, white, cylindrical, up to 15 cm long and 1 mm in diam at the proximal region when dry, with a gelatinous medulla and a cottony cortex (Fig. 1:A, D). **Peridium** two-layered, up to 550 µm thick when dry. **Exoperidium** up to 350 µm thick, chalk white, fragile due to the presence of numerous, hyaline, variously shaped, crystalline particles (Monthoux, **1977**), of loosely arranged, thin-walled, branched, clamped, interwoven hyphae, up to 4.5 µm in diam (Fig. 1:B). **Endoperidium** up to 200 µm thick when dry, rehydrating up to 700 µm thick, well-differentiated, subcartilaginous when dry, gelatinous when rehydrated, of thin-walled, clamped, hyaline, interwoven hyphae, 2 - 4 µm in diam, swollen at septa, in a gelatinous matrix; outer portion periclinal (Fig. 1:F). **Capillitium** absent. **Paracapillitium** of hyaline, thin-walled, branched hyphae, 1.5 - 5 µm in diam, some hyphae with dense cytoplasmic contents staining dark blue with cotton blue while others remain unstained;

Figure 1: A-I. *Gastrosporium simplex.* **A**: sporocarps with rhizomorphs. **B**: exoperidial hyphae and crystalline particles. **C**: paracapillitium and spores. **D**: transection of a rhizomorph. **E**: spores in equatorial lateral (el), distal polar (dp) and proximal polar view (pp). **F**: endoperidium. **G**: hyphae of the rhizomorph outer medullae in longitudinal section, seen in transection at H. **H**: rhizomorph cortex of clamped hyphae and crystalline particles (a) and some medulla hyphae in transection (b). **I**: amorphous tissue at the center of the rhizomorph. Scale: 15 mm for A; 25 µm for B-C, F; 200 µm for D; 10 µm for E, G-I.


A
15 mm
25 µm
B
C
D
E
dp
el
pp
F
a
H
b
200 µm
10 µm
G
I

clamp connections present (Fig. 1:C). **Rhizomorph** cortex homologous to exoperidial tissue, of hyaline, thin-walled, and loosely interwoven hyphae, up to 5 µm in diam, covered by crystalline particles (Fig. 1:H); clamp connections present; medulla with inner portion structureless (Fig. 1:I); outer portion pseudoparenchymatous in transection (Fig. 1:H), longitudinally arranged, rarely branched, clamped, hyaline hyphae, Cb+ (Fig. 1:G). **Basidia** not seen, 8-spored (Pilát, **1934**) or 4-spored (Miller & Askew, **1982**). **Spores** ellipsoidal in lateral view, circular in polar view, up to 4 - 5.5 x 3 - 4.2 µm, [n=20], (x= 4.7 ±0.56 x 3.7 ±0.3); E=1.4-1.5; Q= 1.48±0.1; radially symmetric, heteropolar, ornamentation verrucose, < 0.2 µm, uniguttulate, apiculus inconspicuous (±3 µm), thin-walled, singly pale yellow in KOH, not cyanophilous, nonamyloid (Fig. 1:E). Verrucae by SEM photomicrography irregular in size and shape.

Habit, Habitat and Season: hypogeous to emergent, gregarious; under *Tritinax campestri* and close to different grass species in sandy soil; fruiting during summer.

Collection examined: Argentina: Prov. Córdoba: Dpto: Pocho, Camino a la Laguna de Pocho, 15-XII-1991, L.S. Dominguez #1145 (CORD).

Discussion: Synonymy follows Pilát (**1934**) and Askew & Miller (**1982**). *Gastrosporium simplex* was reported growing in xerothermic conditions associated with various grasses (Dring, **1972**; Pilát, **1934**). The mycelium is described as growing as a network amongst roots and invading the root in a parasitic manner (Monthoux and Röllin, **1976**). Askew & Miller (**1982**) reported *Gastrosporium simplex* as growing in soils with high calcium content. Additional studies are needed to more clearly determine the biology of this fungus.

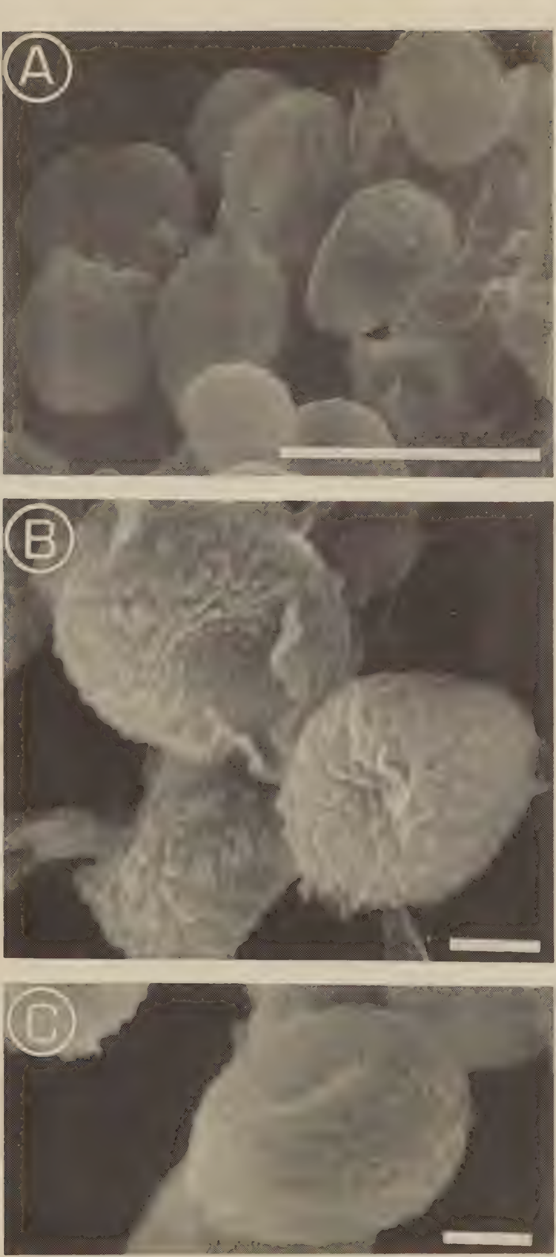
Previously known only from the Mediterranean and central Europe, Asia Minor and North America, this is a new record for the Southern Hemisphere.

Pilát (**1934**) described the development of the sporocarp as auleate. In our description we provide additional information on spore morphology and measurements.

ACKNOWLEDGMENTS

We thank Dr. James Trappe, Dr. Ross Beever, and Dr. Roy Halling for reviewing the manuscript, CONICOR for financial support, USDA Forest Service, Pacific Northwest Research Station, for facilities, and CONICET for providing the senior author's scholarship.

Fig. 2. A-C. SEM photomicrographs of *Gastrosporium simplex* spores. Scales: A= 5 µm B-C= 1 µm.


A
B
C

REFERENCES

Ahmad, S. 1950. Studies in the Gasteromycetes V. Sydowia 4:124-127.

_____. 1952. Gasteromycetes of West Pakistan. Panjab University Press. India. 91 pp.

Bugnon, F. and A. Petitberghien. 1949. Sur la presénce aux environs de dijon du *Gastrosporium simplex* Matt. Bull. Soc. Mycol. France 65:61-65.

Dring, D.M. 1973. Gasteromycetes. In, Ainsworth, G.C, F.Sparrow and A. Sussman. The Fungi an Advanced Treatise. IVB. Academic Press. U.S.A. pp 451-478.

Domínguez de Toledo, L.S. 1989. Contribución al conocimiento de los Gasteromycetes del centro de Argentina. Ph.D. Thesis. 226 pp.

_____. 1993. Gasteromycetes (Eumycota) del centro y oeste de la Argentina. I. Análisis crítico de los caracteres taxonómicos, clave de los géneros y Orden Podaxales. Darwiniana 32(1-4):195-235.

_____. 1994. Gasteromycetes (Eumycota) del centro y oeste de la Argentina. II. Ord. Phallales. Darwiniana. In press.

Henning, B. 1971. Handbuch für Pilzfruende. Vol. II. Gustav Fischer Verlag, Jena, East Germany.

Kelly, K.L. and D.B. Judd 1955. The ISCC-NBS method of designating color and dictionary of color names. U.S. Dept. of Commerce, Nat. Bur. Standards Circ. 553. Washington D.C. 158 pp.

Kers, L.E. 1980. Fynd av *Gastrosporium simplex* och *Cordyceps canadiensis* i Sverige. Svensk Bot. Tidskr. 74:29-30.

Mattirolo, O. 1903. I funghi ipogei Italiani raccolta da O. Beccari, L. Caldesi, A. Carestia, V. Cesati, P.A. Saccardo. Mem. Reale Accad. Sci. Torino, ser. 2, 53:329-366.

Miller, O.K. and W.B. Askew. 1982. The genus *Gastrosporium* in North America. Can. J. Bot. 60:364-368.

Monthoux, O. 1977. Nature des cristaux de l'exopéridium du *Gastrosporium simplex* Matt. Schweiz Ztschr. Pilzk. 55:89-92.

_____. and O. Röllin. 1976. La flore fongique des stations xériques de la région de Genève III. Gastrosporiaceae. Candollea 31:119-125.

Pilát, A. 1934. Sur le genre *Gastroporium* Mattirolo (Gastéromycetes). Bull. Soc. Mycol. France 50:37-49.

_____. 1958. Gastrosporiales. In, F.A. Novák (ed.). Flora CSR, B: 226-233, 747-748. Praha.

Rauschert, S. 1956. Die Steppentrüffel *Gastrosporium simplex* Matt. in Mitteldeutschland. Z. Pilzkunde 22:80-82.

Winterhoff, W. 1974. Mannstreu-Seitling (*Pleurotus eryngii*) und Stepentrüffel (*Gastrosporium simplex*) zwei seltene Trockenrasenpilze in der Pfalz. Mitt. Pollichia Pfälz. Vereins Naturk. 1, 21:68-71.

MYCOTAXON

Volume LXIV, p. 449-454 September 1997

NOTES ON SCLEROTINIACEOUS FUNGI ON CASTANEA AND CASTANOPSIS IN ASIA[*]

WEN-YING ZHUANG and ZHENG WANG

Systematic Mycology & Lichenology Laboratory
Institute of Microbiology, Chinese Academy of Sciences, Beijing, China

ABSTRACT Six taxa of the sclerotiniaceous fungi on *Castanea* and *Castanopsis* in Asia are reported. Among them, *Lambertella obpyriformis* and *Lanzia castanopsidis* are treated as new.

1. **Ciboria americana** E. J. Durand, Bull. Torry Bot. Club 29: 461, 1902.

Specimens examined: **China**: on involucres and spines of *Castanopsis* sp., Xishan, Kunming, Yunnan, J. Z. Zhou, 9 VIII 1938, HMAS 17037. **Japan**: on burrs of *Castanea* sp., Gumma-Ken, Honshu, S. Imai & R. P. Korf, 7 X 1961, CUP-JA 1881.

Notes: This species was commonly found in North America and Europe (White, 1941; Dennis, 1968; Palmer, 1993). Collections from China and Japan are rarely encountered.

2. **Ciboria glaucescens** (Penz. & Sacc.) W. Y. Zhuang & Z. Wang, **comb. nov.**

≡ *Phialea glaucescens* Penz. & Sacc., Malpighia 15: 204, 1901.

≡ *Moellerodiscus glaucescens* (Penz. & Sacc.) Dumont & S. E. Carp., Mem. N. Y. Bot. Gard. 33: 218, 1981.

Diagnostic features: Dried apothecia discoid, stipitate, 0.2-1.7 mm in diam, hymenium dark chestnut brown to nearly black, gray when rehydrated; receptacle concolorous and surface somewhat furfuraceous; stipes slender, 0.7-4.0 x 0.1 mm long when dry. Ectal excipulum of textura angularis, 33-50 µm thick; cells 3-10 x 5-16 µm, walls light brown; outside pustulate, with a few hyphal protrusions, hyphal walls brown and roughened. Medullary excipulum of textura angularis to textura intricata, 50-80 µm thick or more, hyphal walls light brown.

---

[*] Partially supported by the National Natural Science Foundation of China.

Hymenium 50-70 µm thick. Asci 8-spored, J+, pore walls blue in Melzer's reagent, with two basal dots stained darker, 43-62 x 4.5-6.0 µm. Ascospores ellipsoid to elongate-ellipsoid, uniseriate to irregularly uniseriate, with two tiny polar guttules, 5.5-7.0 x 1.7-2.3 µm. Paraphyses 1.5-2.0 µm wide.

Specimens examined: **Indonesia**: on spiny involucre of *Castanopsis argentea*, Mt. Gedeh, Tjibodas, Java, M. A. Rifai, Nasutiou & R. P. Korf, 7 XII 1961, CUP-SA 37; on spiny involucre of *Castanopsis* sp., Tjibodas, Java, M. A. Rifai, Nasution & R. P. Korf, 8 XII 1961, CUP-SA 43; on spiny involucre of *Castanopsis javanica*, Tjibodas, Java, M. A. Rifai, Nasutiou & R. P. Korf, 9 XII 1961, CUP-SA 121; on spiny involucre of *Castanopsis javanica*, Tjibodas, Java, M. A. Rifai, Nasutiou & R. P. Korf, 10 XII 1961, CUP-SA 141, 142; on spiny involucre of *Castanopsis javanica*, Mt. Gedeh, Tjibodas, Java, M. A. Rifai, Nurta & R. P. Korf, 13 XII 1961, CUP-SA 219; on spiny involucre of *Castanopsis javanica*, Mt. Gedeh, Tjibodas, Java, M. A. Rifai, Nurta & R. P. Korf, 21 XII 1961, CUP-SA 363, 383; on spines of *Castanopsis argentea*, Botanical Garden, Tjibodas, Java, K. P. Dumont & Wirawan, 3 I 1967, CUP-SA 2973; on spines of *Castanopsis argentea*, Mt. Gedeh, Tjibodas, Java, K. P. Dumont & Wirawan, 4 I 1967, CUP-SA 2976; on spines of *Castanopsis* sp., Mt. Gedeh, Tjibodas, Java, K. P. Dumont & Nurta, 5 I 1967, CUP-SA 3013.

Notes: This species was commonly found in Tjibodas, Java and treated as *Moellerodiscus glaucescens* (Penz. & Sacc.) Dumont & S. E. Carp. (Carpenter, 1981). But the excipular structure of the fungus fits well that of the genus *Ciboria* Fuckel. A transfer to *Ciboria* is proposed.

3. **Lambertella obpyriformis** W.Y. Zhuang & Z. Wang, **sp. nov.** (Fig. 1)

Ab *Lambertella buchwaldii* ascosporis angustis, obpyriformibus, 10.5-13.5 x 5.0-6.8 µm differt.

Apothecia discoid, stipitate, 0.5-1.8 mm in diam when dry, stipes short, 0.3-0.5 mm long when dry; hymenium Tawny to Cinnamon Rufous (Ridgway) when fresh and light brown when dry; receptacle lighter than hymenium, surface slightly striate or silky. Ectal excipulum of textura prismatica to textura angularis, 38-51 µm thick, cells 10-27 x 5-10 µm, walls highly refractive; covering layer 2-3 hyphal layer thick, hyphae 2.5-4.0 µm wide; inner layer not clearly distinguishable. Medullary excipulum of textura intricata, 75-330 µm thick, hyphae 3-6 µm wide, hyphal walls refractive. Subhymenium ca 20 µm thick.

Hymenium 115-122 µm thick. Asci subcylindrical, 8-spored, J+ in Melzer's reagent, 82-107 x 8-9(-10) µm. Ascospores obpyriform, with upper end obviously broader than the lower one, hyaline within asci and brown after discharge, with one large and one small guttules, occasionally a septum formed between the large upper portion and small lower portion, 10.5-13.5 x 5.0-6.8 µm. Paraphyses filiform, ca 2 µm wide.

Holotype: **China**: on a leaf blade of ?*Castanopsis* sp., Huangshan, Anhui, Z. Wang (1433), 25 IX 1996, HMAS 71774.

Notes: In the genus *Lambertella* Hoehn., the closest species to *Lambertella obpyriformis* is *Lambertella buchwaldii* V. P. Tewari & Ram N. Singh. The former differs from the latter in the narrow and obpyriform ascospores which are measured 10.5-13.5 x 5.0-6.8 µm instead of 10-15 x 6-10 µm, shorter asci, thicker ectal excipulum, presence of a covering layer in the ectal excipulum, and smaller apothecia. The ascospore shape of *Lambertella obpyriformis* is distinctive in the genus.

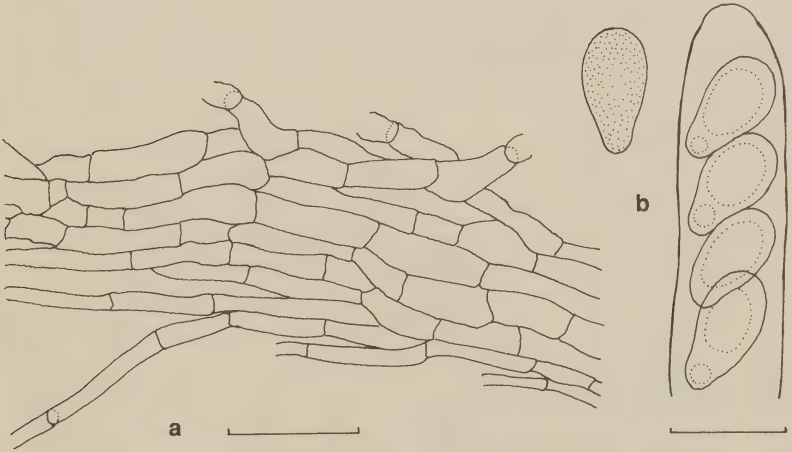


Fig. 1 *Lambertella obpyriformis*: **a**. structure of ectal excipulum, scale = 20 µm; **b**. one brown ascospore and a portion of ascus with hyaline ascospores, scale = 10 µm; all from holotype.

4. **Lanzia castanopsidis** Dumont, W. Y. Zhuang & Korf, **sp. nov.** (Fig. 2)

Ab *Rutstroemia renispora* apotheciis majusculis, margine crenatis, excipulis ectalibus eumorphis, ascis 94-105 x 10-12 µm, ascosporis ad extremitates angustis, 9-11 x 4-5 µm differt.

Dried apothecia discoid, margin dentate to crenate, 0.8-2.0 mm in diam, hymenium warm brown, brown to orange brown; receptacle brown, surface with hyphal scales; stipes brown to dark brown, surface furfuraceous, 0.5-2.0 x 0.2 mm. Ectal excipulum of textura prismatica to textura porrecta, 50-100 µm thick; cells 8-25 x 8-15 µm, walls subhyaline, not gelatinous, somewhat refractive; covering layer 1-3 hyphal layers thick, hyphae light brown, walls roughened, forming hyphal scales, inner layer 43-51 µm thick. Medullary excipulum of textura intricata, 127-470 µm thick; hyphal walls subhyaline, seemingly gelatinous. Hymenium 90-102 µm thick. Asci 8-spored, J+, pore walls strongly blue in Melzer's reagent, as two lines, 94-105 x 10-12 µm. Ascospores reniform to tear-shaped, curved, one end slightly larger, hyaline, with two large guttules, mostly uniseriate, 9-11 x 4-5 µm. Paraphyses filiform, some slightly enlarged at apex, 2-3 µm at apex and 2 µm below. Spermatia not seen.

Holotype: **Indonesia**: on petioles of *Castanopsis argentea*, Nature Reserve, Tjibodas, Java, K. P. Dumnot & Nurta, 3 I 1967, CUP-SA 2928.

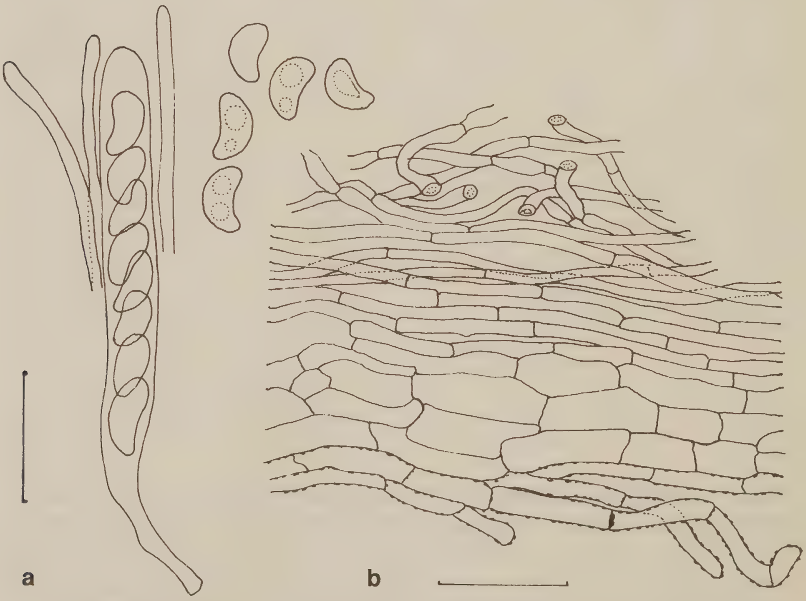


Fig. 2 *Lanzia castanopsidis*: **a**. ascus, upper portion of paraphyses, and ascospores, scale = 20 µm; **b**. structure of ectal excipulum, scale = 30 µm; all from holotype.

Other specimens examined: **Indonesia**: on stromatized petioles of *Castanopsis* sp., Tjibodas, Java, K. P. Dumont & Wirawan, 4 I 1967, CUP-SA 2974; on *Castanopsis* sp., along trail up Mt. Gedeh, Tjibodas, Java, K. P. Dumnot & Nurta, 5 I 1967; on fruit of *Castanopsis* sp. Mt. Gedeh, Tjibodas, Java, K. P. Dumont, Wirawan & Nurta, 6 I 1967, CUP-SA 3065.

Notes: The excipulum of *Lanzia castanopsidis* is very similar to the typical structure of the genus *Lambertella.* But brown ascospores were never detected in the careful microscopic examination. This fungus is similar to *Rutstroemia renispora* (Ellis) W. L. White (White, 1941) in the shape and length of ascospores but differs from the latter in apothecia larger, apothecial margin obviously dentate to crenate instead of smooth, ectal excipulum well-developed instead of not well-marked, asci 94-105 x 10-12 µm vs. 75-90 x 9-10 µm, ascospores with one end slightly narrower than the other instead of equal-sided, 9-11 x 4-5 µm vs. 9.5-11.5 x 3.5-4.5 µm, and the spermatia not seen.

Although Baral (1994) listed *Lanzia* Sacc. as a synonym of *Rutstroemia* P. Karst, more collections of both genera need to be examined before we reach the final conclusion. The generic concept of *Lanzia* accepted here follows Dumont (1972) and Korf (1973) for the time being.

5. **Lanzia huangshanica** W. Y. Zhuang & Korf, Mycosystema 7: 13, 1995 forma **huangshanica**

Specimens examined: **China**: on stromatized leaf petioles of *Castanopsis*, Huilong Bridge, Huangshan, Anhui, Y.-r. Lin, Y. Wang & W.-y. Zhuang, 29 IX 1993, HMAS 61846; on leaf petioles, Huilong Bridge, Huangshan, Anhui, Y.-r. Lin, S.-m. Yu, B. Deng, H.-y. Xing, W.-b. Li & B.-x. Liu, 11 VI 1994, HMAS 68505. **Japan**: on petioles of *Castanopsis* sp., Mt. Kiyosumi Chiba Prefecture, R. P. Korf & Shimizu, 14 XI 1958, Herb-Korf; on blackened petioles of "Kojii"(Shia), Kochi Pref., Shikoku., T. Ito, T. Wada, Kumiko Korf, & R. P. Korf, 25 VIII 1959, CUP-FJ 1411; on petioles of *Castanopsis sieboldii*, Kagoshima-Ken, Yaku Island, Kobayasi, Indoh, Tubaki, Soneda, Furukawa & R. P. Korf, 25 VIII 1959, CUP-FJ 1945; on petiole of *Castanopsis* spp., Mt. Kiyosumi, Chiba Pref., Honshu, Y. Hiyashi, R. Imazeki, K. Aoshima, M. Soneda, S. Udagawa & R. P. Korf, 2 XII 1963, CUP-FJ 2890; on petioles of *Castanopsis cuspidata* var. *sieboldii*, Mt. Kiyosumi, Chiba Pref., Honshu, R. Imazeki, K. Aoshima, M. Soneda, Y. Hiyashi, S. Udagawa & R. P. Korf, 3 XII 1963, CUP-FJ 2891.

Notes: Zhuang (1995) provided the detailed description of *Lanzia huangshanica*, mentioned the distinctions of the fungus from its similar species, and discussed the minor differences between the Chinese collections and the Japanese material which were treated as intraspecific variations. It seems that the Japanese collections have slightly longer ascospores which are up to 28 μm long.

6. **Lanzia huangshanica** forma **aurantiaca** W. Y. Zhuang, Mycosystema 7: 14, 1995.

Specimens examined: **China**: on stromatized leaf petioles of *Castanopsis* sp., Huangshan, Anhui, Y.-r. Lin, Y. Wang & W.-y. Zhuang, 29 IX 1993, HMAS 61847; on stromatized leaf petioles of *Castanopsis* sp., Huangshan, Anhui, Y.-r. Lin, Y. Wang, W.-y. Zhuang, S.-m. Yu & W.-j. Wu, 26 IX 1993,HMAS 61850.

Notes: The distinctions between *Lanzia huangshanica* forma *huangshanica* and forma *aurantiaca* were indicated by Zhuang (1995).

ACKNOWLEDGEMENTS

The authors would like to express their deepest thanks to Prof. R. P. Korf of Cornell University (CUP) for sending specimens on loan for this study, providing useful references, consultation, and critical review of this paper, to Ms. S. C. Gruff (CUP) for sending specimens on loan and sending reprints, and to Dr. J.-y. Zhuang for correction of the Latin diagnoses.

REFERENCES

Baral, H.-O. (1994) Comments on "Outline of the ascomycete – 1993". *Syst. Ascom.* **13**: 113-128.

Carpenter, S. E. (1981) Monograph of *Crocicreas* (Ascomycetes, Helotiales, Leotiaceae). *Mem. N. Y. Bot. Gard.* **33**: 1-290.

Dennis, R. W. G. (1968) *British Ascomycetes.* Cramer. Lehre.

Dumont, K. P. (1972) Sclerotiniaceae III. The generic names *Poculum, Calycina* and *Lanzia. Mycologia* **64**: 911-915.

Korf, R. P. (1973) Discomycetes and Tuberales. In Ainsworth, G. C., F. K. Sparrow & A. S. Sussman (eds.), *The Fungi: an Advanced Treatise.* **4A**. Academic Press. New York & London.

Palmer, J. T. (1993) *Lanzia echinophila* and two further species of Sclerotiniaceae on oak cupules: a tale from the Vienna Woods. *Ost. Zeitschr. f. Piltzk.* **2**: 1-5.

White, W. L. (1941) A monograph of the genus *Rutstroemia* (Discomycetes). *Lloydia* **4**: 153-240.

Zhuang, W.-y. (1995) A few petiole-inhabiting discomycetes in China. *Mycosystema* **7**: 13-17.

MYCOTAXON

Volume LXIV, pp. 455-463 September 1997

BCCM™/Allev 2.00 an Automated System for the Identification of Yeasts

Vincent Robert, Pierre Evrard and Grégoire L. Hennebert

Belgian Co-ordinated Collections of Micro-organisms (BCCM™), Mycothèque de l'Université Catholique de Louvain (MUCL), Laboratoire de Mycologie Systématique et Appliquée, Université Catholique de Louvain, Place Croix du Sud 3, B-1348 Louvain-la-Neuve, Belgium

Abstract

BCCM™/Allev 2.00, an identification system for yeasts, has been developed as a complete package that includes miniaturized tests (growth and fermentation) in microplates, an automated reading system, and a new Windows™ version of the Allev identification software. BCCM™/Allev 2.00 employs current taxonomic criteria (88 physiological tests and 8 morphological features) and recognizes 693 described species. Unlike other identification systems the BCCM™/Allev 2.00 database is fully updatable and can be expanded to include newly-described taxa. BCCM™/Allev 2.00 performs identifications by computing similarity coefficients and can recognize undescribed species when low similarity levels are obtained. In a test of the efficiency of the system using 50 type strains of yeasts, 90% of the strains received the correct species name in the first position while the remaining strains were identified correctly in the second position. The average congruence of the results of physiological tests with the published descriptions of the 50 strains was 97.9%. Using the BCCM™/Allev 2.00 automated identification system, an operator can identify up to 500 isolates per month and each identification can be performed in as little as 5 days. BCCM™/Allev 2.00 is therefore well-suited for use in ecological, environmental and clinical studies involving the identification of large numbers of isolates and a great diversity of yeast species.

Introduction

Auxanographic tests in tubes for the identification of yeasts (Kreger-van Rij, 1987; Van der Walt and Yarrow, 1984) are time-consuming, labour-intensive and require experienced and highly-skilled operators. Applying such techniques, only 30 to 50 strains can be identified per month. This is far from satisfactory for ecological, environmental or clinical studies involving large numbers and a great diversity of yeast isolates.

This paper describes a new yeast identification system called BCCM™/Allev 2.00 and demonstrates the efficiency of this system when compared to conventional taxonomic methods. As a complete package it includes a miniaturized test system, an automated reading and computing system of test results, and a new Windows™ version of the Allev (Robert *et al.*, 1994) identification software. This new system employs conventional taxonomic criteria (96 tests of growth, fermentation and morphology) (Kreger-van Rij, 1987; Van der Walt and Yarrow, 1984) and recognizes 693 described yeast species. Growth and fermentation tests are conducted in microplates and test results are determined spectrophotometrically using an absorbance reader connected to a computer. BCCM™/Allev 2.00 performs identifications by computing similarity coefficients (Robert *et al.*, 1994); thus, it can recognize potentially new species when low similarity levels are obtained. The reference database can be enlarged and updated by the user and can include data for undescribed taxa. Because the system is automated, the operator can handle a large number of strains on a monthly basis and reduce the time necessary to identify each strain.

Materials and methods

The general procedure for the identification of yeasts used in BCCM™/Allev 2.00 is illustrated in Fig. 1. The symbols for test-media (Tables 1-9) used in Barnett *et al.* (1990) have been employed for consistency. However, of the 88 physiological tests described in the BCCM™/Allev 2.00 package, the media for 82 tests have been modified from other sources specifically for the system. In the column labelled "Data" the abbreviations A and M indicate that tests are read automatically or manually, respectively.

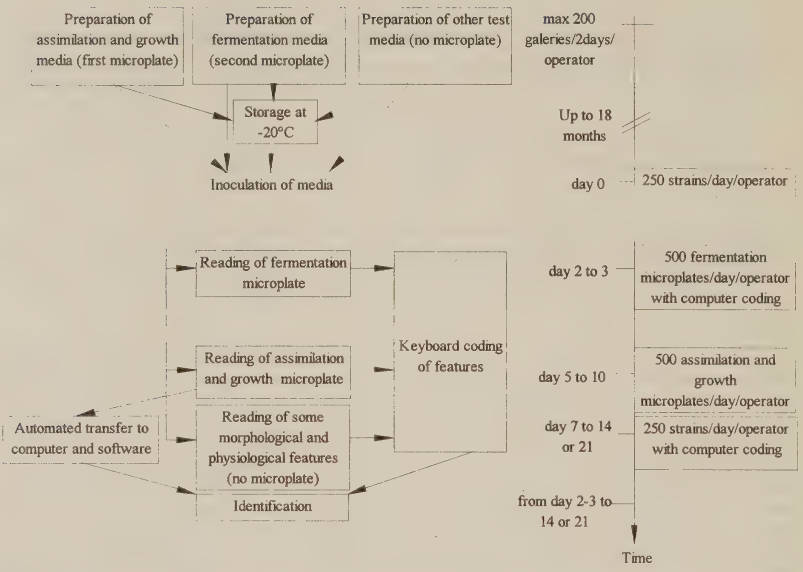

Preparation of assimilation and growth media (first microplate)
Preparation of fermentation media (second microplate)
Preparation of other test media (no microplate)
max 200 galeries/2days/ operator
Storage at -20°C
Up to 18 months
Inoculation of media
day 0
250 strains/day/operator
Reading of fermentation microplate
day 2 to 3
500 fermentation microplates/day/operator with computer coding
Keyboard coding of features
Reading of assimilation and growth microplate
day 5 to 10
500 assimilation and growth microplates/day/operator
Automated transfer to computer and software
Reading of some morphological and physiological features (no microplate)
day 7 to 14 or 21
250 strains/day/operator with computer coding
Identification
from day 2-3 to 14 or 21
Time

Fig. 1. General identification scheme used in BCCM™/Allev 2.00. Broken lines (---) indicate operations that are optional.

Table 1. Tests F1 to F14: Composition of media for the fermentation of carbohydrates (Basal medium: demineralized water 100 ml, yeast extract 0.4 g, peptone 0.7 g, plus carbon source)

Code	Carbon source	Amount	Data	Code	Carbon source	Amount	Data
F1	D-glucose	2.7 g	M	F8	lactose	2.7 g	M
F2	D-galactose	2.7 g	M	F9	cellobiose	2.7 g	M
F3	maltose	2.7 g	M	F10	melezitose	2.7 g	M
F4	methyl α-D-glucoside	2.7 g	M	F11	raffinose	5.4 g	M
F5	sucrose	2.7 g	M	F12	inulin	2.7 g	M
F6	α,α-trehalose	2.7 g	M	F13	soluble starch	2.7 g	M
F7	melibiose	2.7 g	M	F14	D-xylose	2.7 g	M

Table 2. Tests C1 to C44: Composition of media for the assimilation of carbohydrates (Basal medium: demineralized water 100 ml, yeast nitrogen base (Difco) 1.0 g, plus carbon source)

Code	Carbon source	Amount	Data	Code	Carbon source	Amount	Data
C1	D-glucose	0.78 g	A	C23	glycerol	0.78 ml	A
C2	D-galactose	0.78 g	A	C24	erythritol	0.78 g	A
C3	L-sorbose	0.78 g	A	C25	xylitol	0.78 g	A
C4	D-glucosamine	0.78 g	A	C26	D-glucosamine	0.78 g	A
C5	D-ribose	0.78 g	A	C27	L-arabinitol	0.78 g	A
C6	D-xylose	0.78 g	A	C28	D-glucitol	0.78 g	A
C7	L-arabinose	0.78 g	A	C29	D-mannitol	0.78 g	A
C8	D-arabinose	0.78 g	A	C30	galactitol	0.78 g	A
C9	L-rhamnose	0.78 g	A	C31	myo-inositol	0.78 g	A
C10	sucrose	0.78 g	A	C32	D-glucono-1,5-lactone	0.78 g	A
C11	maltose	0.78 g	A	C33	2-keto-D-gluconate	0.78 g	A
C12	α,α-trehalose	0.78 g	A	C34	5-keto-D-gluconate	0.78 g	A
C13	methyl α-D-glucoside	0.78 g	A	C35	D-gluconate	0.78 g	A
C14	cellobiose	0.78 g	A	C36	D-glucuronate	0.78 g	A
C15	salicin	0.78 g	A	C37	D-galacturonate	0.78 g	A
C16	arbutin	0.78 g	A	C38	DL-lactate	0.78 g	A
C17	melibiose	0.78 g	A	C39	succinate	0.78 g	A
C18	lactose	0.78 g	A	C40	citrate	0.78 g	A
C19	raffinose	0.78 g	A	C41	methanol	0.78 ml	A
C20	melezitose	0.78 g	A	C42	ethanol	0.78 ml	A
C21	inulin	0.78 g	A	C43	propane 1,2 diol	0.78 ml	A
C22	soluble starch	0.78 g	A	C44	butane 2,3 diol	0.78 ml	A

Table 3. Tests N1 to N9: Composition of media for the assimilation of nitrogen (Basal medium: demineralized water 100 ml, yeast carbon base (Difco) 1.77 g, plus nitrogen source)

Code	Nitrogen source	Amount	Data	Code	Nitrogen source	Amount	Data
N1	potassium nitrate	0.11 g	A	N6	creatine	0.11 ml	A
N2	sodium nitrite	0.04 g	A	N7	creatinine	0.087 g	A
N3	ethylamin	0.10 g	A	N8	glucosamine	0.11 g	A
N4	L-lysine	0.10 g	A	N9	imidazole	0.047 g	A
N5	cadaverine	0.10 g	A				

Table 4. Tests V1 to V10: Composition of media for the assimilation of vitamins (Basal medium: demineralized water 100 ml, vitamin free yeast base (Difco) 2.52 g,, plus vitamins)

Code	Vitamins	Composition	Data
V1	without vitamins	Basal medium	A
V2	without myo-inositol	300 µg calcium pantothenate, 3.0 µg biotin, 60 µg thiamine hydrochloride, 60 µg pyridoxine hydrochloride, 60 µg niacin, 30 µg p-aminobenzoic acid, 0.3 µg folic acid, 30 µg riboflavin	A
V3	without calcium pantothenate	1500 µg myo-inositol, 3.0 µg biotin, 60 µg thiamine hydrochloride, 60 µg pyridoxine hydrochloride, 60 µg niacin, 30 µg p-aminobenzoic acid, 0.3 µg folic acid, 30 µg riboflavin	A
V4	without biotin	1500 µg myo-inositol, 300 µg calcium pantothenate, 60 µg thiamine hydrochloride, 60 µg pyridoxine hydrochloride, 60 µg niacin, 30 µg p-aminobenzoic acid, 0.3 µg folic acid, 30 µg riboflavin	A
V5	without thiamine hydrochloride	1500 µg myo-inositol, 300 µg calcium pantothenate, 3.0 µg biotin, 60 µg pyridoxine hydrochloride, 60 µg niacin, 30 µg p-aminobenzoic acid, 0.3 µg folic acid, 30 µg riboflavin	A
V6	without biotin and thiamine hydrochloride	1500 µg myo-inositol, 300 µg calcium pantothenate, 60 µg pyridoxine hydrochloride, 60 µg niacin, 30 µg p-aminobenzoic acid, 0.3 µg folic acid, 30 µg riboflavin	A
V7	without pyridoxine hydrochloride	1500 µg myo-inositol, 300 µg calcium pantothenate, 3.0 µg biotin, 60 µg thiamine hydrochloride, 60 µg niacin, 30 µg p-aminobenzoic acid, 0.3 µg folic acid, 30 µg riboflavin	A
V8	without pyridoxine hydrochloride and thiamine hydrochloride	1500 µg myo-inositol, 300 µg calcium pantothenate, 3.0 µg biotin, 60 µg niacin, 30 µg p-aminobenzoic acid, 0.3 µg folic acid, 30 µg riboflavin	A
V9	without niacin	1500 µg myo-inositol, 300 µg calcium pantothenate, 3.0 µg biotin, 60 µg thiamine hydrochloride, 60 µg pyridoxine hydrochloride, 30 µg p-aminobenzoic acid, 0.3 µg folic acid, 30 µg riboflavin	A
V10	without p-aminobenzoic acid	1500 µg myo-inositol, 300 µg calcium pantothenate, 3.0 µg biotin, 60 µg thiamine hydrochloride, 60 µg pyridoxine hydrochloride, 60 µg niacin, 0.3 µg folic acid, 30 µg riboflavin	A

Table 5. Tests T25, T37, O1 to O4, M1 to M4, ARBHYD and those to determine the presence or absence of morphological features: Composition of media.

Code	Description of test	Composition and/or determination of test results	Data
T25	growth at 25°C	Considered positive if growth occurs in at least one test well in the assimilation microplate incubated at 25°C	A
T37	growth at 37°C	The test is performed according to van der Walt and Yarrow (1984)	M
O1	growth in the presence of cycloheximide 0.1 %	Demineralized water 100 ml, D-glucose 1.5 g, yeast nitrogen base (Difco) 1.0 g, cycloheximide 0.0075 g	A
O2	growth in the presence of cycloheximide 1 %	Demineralized water 100 ml, D-glucose 1.5 g, yeast nitrogen base (Difco) 1.0 g, cycloheximide 0.075 g	A
O3	growth in the presence of 1% acetic acid	The test is performed according to van der Walt and Yarrow (1984)	M
O4	growth on media containing 50% D-glucose	The test is performed according to van der Walt and Yarrow (1984)	M
M1	formation of starch	Lugol solution (van der Walt and Yarrow, 1984) is added to well containing test medium C1 following automatic reading of the assimilation microplate. Considered positive if the medium turns blue	M
M2	production of acetic acid	The test is performed according to van der Walt and Yarrow (1984)	M
M3	hydrolysis of urea	Demineralized water 100 ml, D-glucose 0.15 g, peptone 0.15 g, NaCl 0.75 g, KH_2PO_4 0.3 g, urea (20%) 14 ml, phenol red	M
M4	diazonium blue b reaction	The test is performed according to van der Walt and Yarrow (1984)	M
ARBHYD	hydrolysis of arbutin	Demineralized water 100 ml, yeast extract 0.9 g, arbutin 0.75 g, $FeCl_3$ (1%) 7.6 ml	M

Table 5 (Continued)

TMYC	production of true mycelium	The test is performed according to van der Walt and Yarrow (1984)	M
PMYC	production of pseudo-mycelium	The test is performed according to van der Walt and Yarrow (1984)	M
ARTHR	production of arthroconidia	The test is performed according to van der Walt and Yarrow (1984)	M
VRBUD	vegetative reproduction by budding or splitting	The test is performed according to van der Walt and Yarrow (1984)	M
BALLI	production of ballistoconidia	The test is performed according to van der Walt and Yarrow (1984)	M
BASID	production of basidiospores	The test is performed according to van der Walt and Yarrow (1984)	M
ASCO	production of ascospores	The test is performed according to van der Walt and Yarrow (1984)	M
TELIO	production of teliospores	The test is performed according to van der Walt and Yarrow (1984)	M

Preparation of microplates. Two microplates are prepared for each strain to be identified, one containing fermentation media and the other assimilation and growth media. The media are sterilized by filtration prior to their addition to sterile microplates or by gamma irradiation of filled microplates. For the fermentation microplate, 150 µl of each medium (F1 to F14) is introduced into the wells (Kartell, 96 wells, U-shaped bottom) using a multi-channel pipette. The wells of the assimilation and growth microplate wells (Nunc, 96 wells, flat bottom) are filled with 100 µl of each medium (C1 to C44, N1 to N9, V1 to V10, O1, O2, ARBHYD, and M3). The first two wells of the latter microplate receive no media and are used as blanks. Both microplates are sealed using self-adhesive cellophane paper and can be stored at -18°C or lower temperatures for more than one year.

Inoculation and incubation of microplates. 50 µl of inoculum (MacFarland 2) is introduced into the wells of the fermentation microplate using a multi-channel pipette and each well is sealed with 80 µl of warm paraffin (45-50°C, Fluka 76228). The fermentation microplate is resealed with cellophane, placed upside down in a plastic bag and incubated at 25°C for 3 to 10 days. For the assimilation and growth microplate 50 µl of inoculum (MacFarland 2 diluted by a factor of 10) is introduced into each well and the resealed microplate is incubated at 25°C for 5 to 10 days. Agitation of the assimilation and growth microplates during incubation is not required.

Test reading. The fermentation microplate is read visually and tests are scored as positive when gas bubbles can be seen at the bottom of the wells or when the wells are empty (strong fermentation). Results are coded manually using the computer keyboard. Assimilation and growth tests are read automatically using a microplate reader (DigiScan, Asys Hitech); absorbance values at 405 nm are transferred by cable to a computer and transformed by BCCM™/Allev 2.00 into negative, weak or positive results. The results of every test are transformed independently. Morphological observations and the results of tests O3, O4, ARBHYD, M1, M2, M3, M4 and T37 are read and coded manually.

All tests results for a given strain or species are stored in a file and can be modified or updated at the convenience of the user.

Identification by BCCM™/Allev 2.00. Identification is performed by computation of similarity coefficients between the data recorded for the strain to be identified and all taxa (presently 693 yeast species) included in the database. Missing values are not taken into account. The names of taxa are displayed in order of decreasing similarity to the strain to be identified. Detailed reports on the comparisons of each test can be consulted by the user.

Organisms tested. The type strains of 50 species of yeasts were selected randomly from those available at MUCL culture collection for identification to demonstrate the effectiveness of the BCCM™/Allev 2.00 system (Table 6). The strains were analyzed twice and replicate tests were conducted 15 days after the first identification.

Results

The results of the identification of 50 type strains of yeasts are presented in Table 6. No difference between replicates was found.

Table 6. Results of the identification of the type strains of 50 species of yeasts using BCCM™/Allev 2.00. Ident.=identification. Similarity percentages are in comparison with published results.

		Data from fermentation and morphological tests excluded		**Data from fermentation tests included; morphological data excluded**		**Data from fermentation and morphological tests included**	
Taxon names	**MUCL accession number**	**Similarity (%)**	**Ident. position**	**Similarity (%)**	**Ident. Position**	**Similarity (%)**	**Ident. Position**
		A	B	C	D	E	F
Bulleromyces albus	30302	98.5	1	98.8	1	98.9	1
Candida albicans	29919	98.5	2	98.8	2	98.9	2
Candida apis	29802	93.9	2	94.9	2	95.5	2
Candida boidinii	27721	96.9	1	97.4	1	97.7	1
Candida bombicola	29811	100	1	100	1	100	1
Candida castellii	29813	100	1	100	1	100	1
Candida castrensis	31850	93.5	1	94.6	1	95.2	1
Candida catenulata	27731	93.8	1	94.8	1	95.4	1
Candida edax	29824	95.3	2	96.0	2	96.5	1
Candida glabrata	29833	100	1	100	1	100	1
Candida inconspicua	29913	100	1	100	1	100	1
Candida mesenterica	29923	98.5	1	98.7	1	98.9	1
Candida milleri	30041	96.9	1	97.4	1	97.7	1
Candida nitratophila	27855	100	1	100	1	100	1
Candida parapsilosis	29868	95.4	1	96.1	1	96.6	1
Candida pinus	27856	96.9	1	97.4	1	97.7	1
Candida quercuum	29876	100	1	100	1	100	1
Candida rugopelliculosa	29878	96.9	2	97.4	2	97.7	2
Candida rugosa	29879	95.4	2	96.2	2	96.6	1
Candida sake	29880	100	1	100	1	100	1
Candida sorboxylosa	29942	97.0	2	97.5	2	97.8	1
Candida tropicalis	29817	98.5	1	98.7	1	98.9	1
Candida vini	29947	98.5	2	98.7	2	98.9	2
Candida zeylanoides	29912	96.9	1	97.4	1	97.7	1
Cryptococcus albidus var. albidus	30693	92.2	2	93.5	2	94.1	2
Cryptococcus curvatus	29819	95.4	1	96.2	1	96.6	1
Cryptococcus laurentii	30398	98.5	1	98.7	1	98.9	1
Cryptococcus terreus	30418	96.9	1	97.4	1	97.7	1
Dekkera anomala	27702	98.5	1	97.5	1	98.9	1
Filobasidiella neoformans	30412	100	1	100	1	100	1
Hanseniaspora uvarum	30318	98.5	2	98.7	2	98.9	1
Kurtzmanomyces nectarii	38920	100	1	100	1	100	1
Metschnikowia pulcherrima	29874	100	1	100	1	100	1
Pichia acaciae	31916	96.9	1	97.4	1	97.8	1
Pichia anomala	28639	97.0	1	97.5	1	97.8	1
Pichia farinosa	31255	98.5	1	98.7	1	98.9	1
Pichia membranaefaciens	29895	98.5	1	98.8	1	98.9	1
Pichia pastoris	31260	95.3	1	96.0	1	96.5	1
Rhodotorula glutinis	30253	97.0	1	97.5	1	97.8	1
Rhodotorula minuta	30405	96.9	1	97.4	1	97.7	1
Rhodotorula mucilaginosa	27810	97.0	1	97.5	1	97.8	1
Saccharomyces cerevisiae	31999	97.0	1	97.5	1	97.8	1
Saccharomyces capsularis	14479	95.4	1	96.1	1	96.6	1
Schwanniomyces occidentalis	20926	96.9	2	97.4	1	97.7	1
Sporidiobolus johnsonii	31147	95.4	3	96.1	3	96.6	1
Sporobolomyces roseus	28636	100	1	100	1	100	1
Torulaspora delbrueckii	27816	98.5	1	98.7	1	98.9	1
Williopsis saturnus	28638	98.5	1	98.7	1	98.9	1
Yarrowia lipolytica	29821	97.0	1	97.0	1	97.8	1
Zygosaccharomyces rouxii	30254	100	1	100	1	100	1
Averages:		97.5	1.28	97.9	1.22	98.2	1.10
Occurrence in 1st place:			39		42		45
Occurrence in 2nd place:			10		7		5
Occurrence in 3rd place:			1		1		0

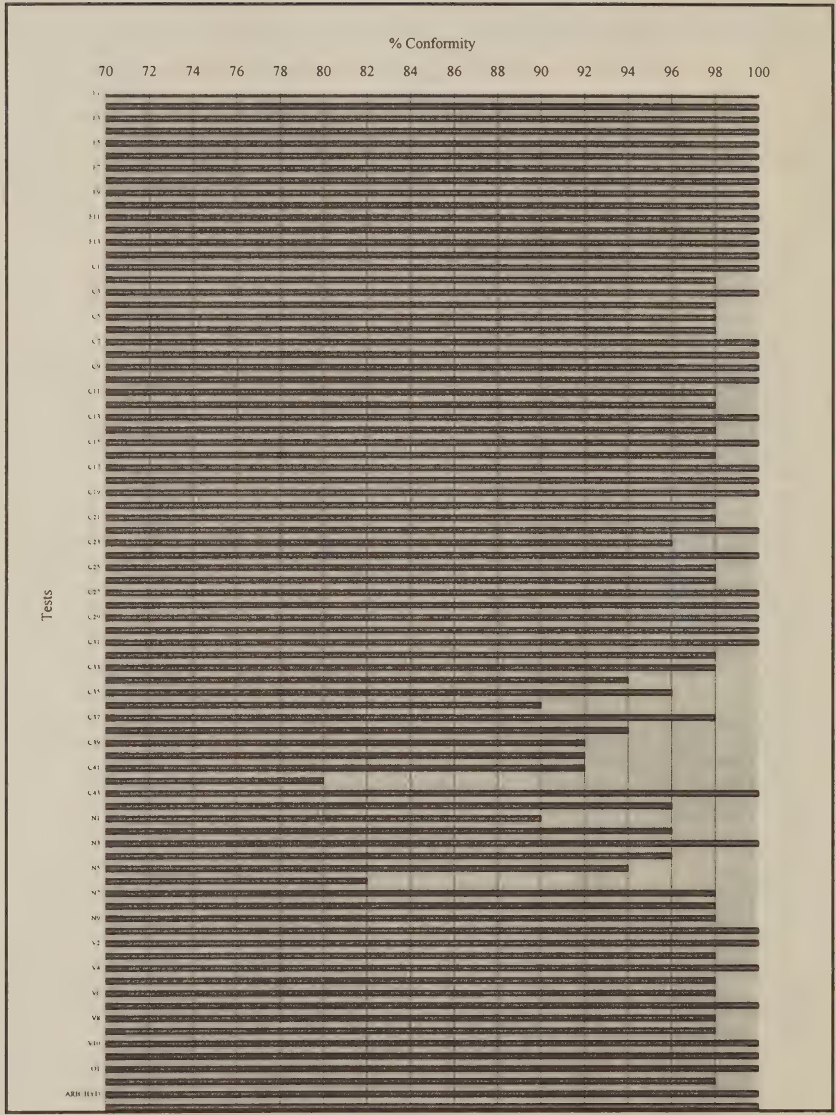


Fig. 2. Percentages of conformity (congruence) between the results obtained by BCCM™/Allev 2.00 for 50 type strains and published descriptions for 82 physiological tests (fermentation: F1 to F14; assimilation and growth: C1 to C44, N1 to N9, V1 to V10, T25, O1, O2, ARBHYD and M3).

Columns A and B in Table 6 provide the similarity coefficients and the position of the correct species name amongst the most similar species selected from the 693 species in the reference database. The data in these columns were obtained using only the assimilation and growth microplate test results. Of the 50 type strains studied, BCCM™/Allev 2.00 returned the correct species name in the first position for 39 strains (78%). The correct names of 10 strains occurred in second place and of 1 strain, in the third position. Columns C and D describe the results of fermentation tests as well as assimilation and growth microplates tests. BCCM™/Allev 2.00 provided the correct name of 84% of the strains in the first position when this information was used for identification. With the addition of morphological data (columns E and F), 90% of the strains received the correct name in first position, 10% in the second and 0% in the third. Thus, the greater the number of tests considered, the higher the percentage of strains that received the correct species name in the first position.

The congruence of the results obtained for 50 type strains of yeasts with the published descriptions of these strains for each of 82 automated physiological tests included in BCCM™/Allev 2.00 are illustrated in Figure 2. The average of the percentages of conformity for all tests was 97.9. The fermentation tests and the majority of assimilation tests conformed completely to published descriptions. However, scores of tests for the assimilation of ethanol (C42) and creatine (N6) were lower at 80% and 82%, respectively.

Discussion

The identification of yeasts using BCCM™/Allev 2.00 is an improvement over conventional testing techniques that involve the preparation and inoculation of media in test tubes (Van der Walt and Yarrow, 1984). The latter methods are time consuming, labour-intensive and tedious. In contrast, the microplates employed in BCCM™/Allev 2.00 can be prepared rapidly and in batches of 500 to 1000 (or more) and stored for 12 months or longer at -18°C. The space required for the storage of microplates is not significant. The use of a multi-chanel pipette also reduces considerably the time required for inoculation. Furthermore, because most of the tests are read automatically and evaluated by the program, the reproducibility rate is high and the results are not operator dependant. At the Mycothèque de l'Université Catholique de Louvain (MUCL) a single operator was able to inoculate and identify only 30 to 50 yeast strains per month using conventional techniques and each identification required 2 to 4 weeks. Using the BCCM™/Allev 2.00 automated system, the operator can identify up to 500 isolates per month and each identification can be performed in 5 to 10 days. The limiting factor for both the number of strains identified and the time required to do so remains the observation of morphological features. However, as indicated in Table 6, the global reliability of the system is high (97.9%) even without morphological data.

Table 7. Characteristics of yeast identification systems. Table based on Deak (1992).

System	Principle	Method	N° of tests	N° of species in database	Time (hr) required for result	Accuracy (%)	References
Allev 2.00	Classical taxonomic characters	Automated/ manual	96	693	240	98.2	
API 20C	Growth	Manual	20	42	72	99 88	St.-Germain and Beauchesne, 1991 Deak and Beuchat, 1993
ATB 32 ID	Growth	Automated/ manual	32	63	48	91 76	Rohm and Lechner, 1990 Deak and Beuchat, 1993
AutoMicrobic	Growth	Automated	30	62	24	83 97	Pfaller *et al.*, 1988 El-Zaatari *et al.*, 1990
MicroLog	Growth/ oxydase	Automated	94	267	24-72	?	Bochner, 1989; Bochner *et al.*, 1977, 1992
Microring YT	Growth	Manual	6	18	48	53	Shankland *et al.*, 1990
Microscan	Enzyme	Manual/ automated	27	42	4	85 96	Land et al., 1991 St.-Germain and Beauchesne, 1991
Minitek	Growth	Manual	12	28	72	97	Lin and Fung, 1987
MTP	Growth	Manual	46	?	120-240	?	Seiler and Busse, 1988
Quantum II	Growth	Automated	20	34	24	82 86	Pfaller *et al.*, 1988 Salkin *et al.*, 1985
SIM	Growth	Manual	20	76	?	91	Deak and Beuchat, 1993
Uni-Yeast-Tek	Growth	Manual	15	42	48	40	Salkin *et al.*, 1987
YeastIdent	Enzyme	Manual	20	42	4	55 60	Salkin *et al.*, 1987 Molina *et al.*, 1992

The major strengths of BCCM™/Allev 2.00 over other yeast identification systems, both manual and automated, are the number of taxa and tests included in the database (Table 7) and the fact that it is based on the same principles and diagnostic criteria employed currently in yeasts systematic. The reference database of BCCM™/Allev 2.00 can be easily modified or enlarged to include both additional taxa and characters, and consequently will accommodate newly-described and undescribed species. The user can also discriminate between species based on numerous strains, species based on a single strain, and atypical, novel or unusual strains that may represent undescribed taxa. This enables the user to tailor BCCM™/Allev 2.00 to a specific application or identification requirement (i.e. agroeconomic, biomedical, ecological).

Identification software that employ similarity coefficients possess advantages over programs that use dichotomous or multiple-entry keys, or probabilities (Pankhurst, 1991; Robert *et al.,* 1994). Keys do not often consider weak or delayed reactions, and like programs based on probabilistic theory, can be mislead by a single error or ambiguous result. In contrast, BCCM™/Allev 2.00 computes all available data and provides the names of all taxa with a similarity level equal to or greater than the one defined by the user. The user must therefore consider not only the species name in the first position (i.e. with the highest similarity level to the strain to be identified) but all names with similarity levels above 92% to 95%, depending on the number of tests included. Differences between the strain to be identified and all species can be reviewed using the report option that locates and describes divergent test results. The final decision in the identification process must therefore be made by the user.

Although BCCM™/Allev 2.00 has been shown to be a reliable system for the identification of yeasts (global reliability of 97.9% for physiological data alone), tests for ethanol and creatine assimilation may generate false results. Methanol and nitrate tests are also somewhat questionable. The lack of congruence between the results of tests obtained by BCCM™/Allev 2.00 for a number of strains and the expected results (i.e. published descriptions) may be explained in part by the loss of physiological properties related to long term or inappropriate methods of storage. However, the reliability of the system is increased to 98.2% when morphological data are considered in conjunction with physiological test results.

Acknowledgements

We sincerely thank T. Boekhout, I. Roberts, W. Untereiner and J.P. Van der Walt for their great help, reviews and comments.

References

Barnett, J. A., R.W. Payne, and D. Yarrow. 1990. Yeasts: Characteristics and identification, 2nd ed. Cambridge.

Bochner, B.R. 1989. Sleuthing out bacterial identities. Nature 339:157-158.

Bochner, B.R, and M.A. Savageau. 1977. Generalized indicator plate for genetic, metabolic, and taxonomic studies with micro-organisms. Appl. Environ. Microbiol. 33:434-444.

Bochner, B.R., B. So, A. Lola II, and P. Gadzinski. 1992. Development of the new test panel for characterization and identification of a wide range of yeast species. Biolog, Inc., CA, U.S.A.

Deak, T. 1992. Simplified Techniques for Identifying Foodborne Yeasts. Abstracts of 8th International Symposium on Yeasts, Atlanta, U.S.A.

Deak, T., and L.R. Beuchat. 1993. Comparison of the SIM, API 20C, and ID 32C systems for identification of yeasts isolated from fruit juice concentrates and beverages. J. Food Prot. 56(7):583-592.

El-Zaatari, M., L. Pasarell, M.R. MacGinnis, J. Buckner, G.A. Land, and I.F. Salkin. 1990. Evaluation of the updated Vitek yeast identification data base. J. Clin. Microbiol. 28:1938-1941.

Kreger-van Rij, N.J.W. 1987. Classification of Yeasts. *In* A.H. Rose and J.S. Harrison (ed.), The Yeasts, vol. 1, 2nd ed., p. 5-61. Academic Press, London.

Land, G.A., I.F. Salkin, M. El-Zaatari, M.R. McGinnis, and G. Hashem. 1991. Evaluation of the Baxter-Microscan 4-hour enzyme-based yeast identification system. J. Clin. Microbiol. 29:718-722.

Lin, C.C.S., and D.Y.C. Fung. 1987. Comparative biochemical reactions and identification of food yeasts by the conventional methods, Fung's minimethod, Minitek, and the Automicrobic System. CRC Crit. Rev. Biotechnol. 7:1-16.

Molina, T.C., S.K. Mishra, and D.L. Pierson. 1992. A microfermentation test for rapid identification of yeasts. J. Med. Vet. Mycol. 30:323-326.

Pankhurst, R.J. 1991. Practical taxonomic computing. Cambridge University Press, Cambridge.

Pfaller, M.A., T. Preston, M. Bale, F.P. Koontz, and B.A. Body. 1988. Comparison of the Quantum II, API Yeast Ident, and AutoMicrobic system for identification of clinical yeast isolates; J. Clin. Microbiol. 26:2054-2058.

Robert, V., J.-E. de Bien, B. Buyck, and G.L. Hennebert. 1994. ALLEV, a new program for computer-assisted identification of yeasts. Taxon 43:433-439.

Rohm, H., and F. Lechner. 1990. Evaluation and reliability of a simplified method for identification of foodborne yeasts. Appl. Environ. Microbiol. 56:1290-1295.

Salkin, I.F., G.A. Land, N.J. Hurd, P.R. Goldson, and M.R. McGinnis. 1987. Evaluation of YeastIdent and Uni-Yeast-Tek yeast identifications systems. J. Clin. Microbiol. 25:264-267.

Salkin, I.F., K.H. Schadow, L.E. Bankaitis, M.R. McGinnis, and M.E. Kemma. 1985. Evaluation of Abbott Quantum II yeast identification system. J. Clin. Microbiol. 22:442-444.

Seiler, H., and M. Busse. 1988. Identifizierung von Hefen mit Mikrotiterplatten. Forum Mikrobiologie. 11:505-509.

Shankland, G.S., V. Hopwood, R.A. Forster, E.G.V. Evans, M.D. Richardson, and D.W. Warmock. 1990. Mutlicenter evaluation of Microring YT, a new method of yeast identification. J. Clin. Microbiol. 28:2808-2810.

St.-Germain, G., and D. Beauchesne. 1991. Evaluation of the Microscan rapid yeast identification panel. J. Clin. Microbiol. 29:2296-2299.

Van der Walt, J. P. and Yarrow, D. 1984. Methods for the isolation, maintenance, classification and identification of yeasts. *In* N.J.W. Kreger-van Rij (ed.), The Yeasts, a Taxonomic Study, p. 45-104. Elsevier, Amsterdam.

MYCOTAXON

Volume LXIV, pp. 465-466 September 1997

MYCOSPHAERELLA PULMONARIAE SP. NOV. FROM BULGARIA

VIOLETA I. FAKIROVA
Institute of Botany, Bulgarian Academy of Sciences
1113 Sofia, Bulgaria

No species of *Mycosphaerella* has ever been reported from *Pulmonaria,* but there are four *Mycosphaerella* names from other genera of the Boraginaceae: *M. asperifolii* (Bommer, Rousseau & Sacc.) Tomilin on *Cynoglossum*; *M. tournefortiae* Petr. & Cif. on *Tournefortia hirsutissima; M. lithospermi* Ellis & Everh. on *Lithospermum* (Tomilin, 1979; Corlett, 1991), and *M. tassiana* var. *arctica* on *Mertensia* (in herbarium DAOM; M. Corlett, *pers. comm.*) The scarcity of reports may be due in part to the difficulty of observing ascomata among the bristles and glandular hairs on many species of Boraginaceae as well as to the blackening of the overwintered plants.

In the course of study of overwintered leaves and stems of *Pulmonaria rubra* Shott, I have observed well-developed ascomata that I considered to be an undescribed species of *Mycosphaerella.* Only *M. asperifolii* is close to the new species as it has, for example, ascospores of comparable dimensions (8-9 x 2-2.5 cm). Examination of the holotype of *M. asperifolii* (=*Sphaeria asperifolii* Bommer, Rousseau & Sacc.) showed the absence of lesions (ascomata scattered, solitary), and smaller asci (28-30 x 5-6 μm) and pseudoparenchymatous cells (8-11 x 5.5-7.7 μm). These differences as well as the distinctive host plant are reason to regard it as a new species. The measurements of 100 ascospores are given in the form: (smallest observed-) mean (-largest observed).

Mycosphaerella pulmonariae sp. nov. Fig. 1

Laesiones amphigenae, circulares, depressae, cinctae margine elevato. **Ascomata** 90-128 μm diam, globosa, nigra, dispersa, solitaria, epiphylla, subepidermalia, ostiolum brevi apicali papillati. Paries ascomata pseudoparenchymati, textura angularis, 14-19 x 9-13 μm. **Asci** aparaphysati, subsessilies, cylindrici usque obpyriformis, crassitunicati fasciculati, bitunicati, 33-39 x 5.5-6.5 μm, octospori. **Ascospores** fusiformes, (7.5-) M=9.6 (-11.3) x (1.3-) M=1.9 (-2.5) μm, sine colore, laeves, guttulatae, in medio septate, recta vel leviter curvatae cum extremis rotundatis.

Holotypus: in foliis emortui *Pulmonaria rubra* Schott, Bulgaria, mt. Vitosha, Bistrica, 15.04.1995, V. Fakirova, SOM 21574-M.

Lesions amphigenous, circular, with a raised margin. **Ascomata** 90-128 μm diam, globose, black, scattered, solitary subepidermal, epiphyllous, with a short, papillate apical ostiole. Ascomatal wall pseudoparenchymatous, textura angularis, 14-19 x 9-13 μm. **Asci** numerous, fasciculate, aparaphysate, subsessile, bitunicate, somewhat cylindrical to pyriform, thick-walled, 33-39 x 5.5-6.5 μm, 8-spored. **Ascospores** fusiform (7.5-) M=9.6 (-11.3) x (1.3-) M=1.9 (-2.5) μm, colourless, smooth, guttulate, septate in the middle or slightly below the middle, straight to slightly curved, with rounded or acute ends.

Holotype: on overwintered leaves of *Pulmonaria rubra* Shott, Bulgaria, Vitosha region. Vitosha Mt. (near the village of Bistriča), 15.04.1995. V. Fakirova, SOM 21574-M.

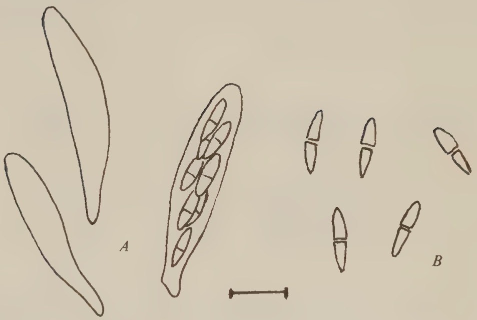


Fig. 1. ***Mycosphaerella pulmonariae.*** a) asci; b) ascospore. Scale bar = 10 μm.

ACKNOWLEDGMENTS

I am grateful to Dr. Michael Corlett for the examination of the material, valuable comments, reading the manuscript and helpful advice. I also extend my gratitude to Mr. S. Chiesa, the Curator from Saccardo's Mycological Herbarium, Padua.

The research has been supported by the National Science Fund of the Ministry of Science and Education, Republic of Bulgaria.

LITERATURE CITED

Corlett, M. 1991. An annotated list of the published names in *Mycosphaerella* and *Sphaerella*. J. Cramer, Berlin-Stuttgart, 328 pp.
Tomilin, B. A. 1979. Opredelitel' gribov roda *Mycosphaerella* Johans. Nauka, Leningrad, 319 pp.

MYCOTAXON

Volume LXIV, pp. 467-484 September 1997

DESCRIPTION OF *CALONECTRIA RUMOHRAE* SP. NOV. (ANAMORPH = *CYLINDROCLADIUM RUMOHRAE* SP. NOV.)

N. E. EL-GHOLL[1], A. C. ALFENAS[2], D. T. JUNGHANS[2],
T. S. SCHUBERT[1], J. W. MILLER[1], AND R. M. LEAHY[1]

[1] Florida Department of Agriculture and Consumer Services; Division of Plant Industry, P. O. Box 147100, Gainesville, FL, U.S.A. 32614-7100

[2] Universidade Federal de Viçosa, 36570 - Viçosa - MG - BRAZIL

ABSTRACT

Petiole lesions on leatherleaf fern [*Rumohra adiantiformis* (G. Forst.) Ching] from Panama were examined, and a fungus characteristic of the genus *Cylindrocladium* was isolated. Perithecia developed in culture on irradiated segments of carnation (*Dianthus caryophyllus* L.) leaves on water agar (CL/WA) and on irradiated stems of peanut (*Arachis hypogaea* L.) on water agar (PS/WA) within 3-4 weeks. Ascospores were exuded through the ostiole and single ascopore cultures were established. All single ascopore cultures yielded the *Cylindrocladium* anamorph and produced perithecia on CL/WA and PS/WA. Comparison of morphological features of this fungus to those of *Cylindrocladium* spp. that bear the closest resemblance to it, *C. heptaseptatum* Sobers, Alfieri & Knauss and *C. quinqueseptatum* Boedijn & Reitsma, showed differences in morphology of phialides, size and septation of conidia.

Isoenzyme and RAPD (Random Amplified Polymorphic DNA) markers were also used to compare the fungus under study with four isolates of *C. heptaseptatum* and two of *C. quinqueseptatum*. Based on 40 isoenzyme and on 206 RAPD markers detected for all isolates, three distinct groups made up, respectively by *C. heptaseptatum*, *C. quinqueseptatum* and by the fungus from Panama were found. The morphological differences and the molecular data indicate that the fungus under study represents a new taxon.

Calonectria rumohrae is proposed for the binomial of the homothallic sexual state, and *Cylindrocladium rumohrae* for the corresponding asexual state.

Key Words: *Calonectria rumohrae, Cylindrocladium rumohrae, Rumohra adiantiformis, homothallism*, molecular taxonomy.

INTRODUCTION

In 1994, samples of diseased leatherleaf fern were collected in a fernery in Panama. Some of the plants had petiole lesions which yielded a *Cylindrocladium* upon culturing. Comparison of this fungus with similar known isolates of *Cylindrocladium* species showed it to be unique mainly in macroconidial width and septation.

Biochemical markers such as proteins and isoenzymes or molecular markers at the DNA level, may be useful in solving taxonomic disputes, especially when morphological characteristics overlap or vary among isolates or specimens within a genus or species. Isoenzymes have been widely used to distinguish different taxa and to identify unknown species (6,16,17).

At present, species of *Cylindrocladium* are identified mainly on vesicle morphology, conidial size and septation. However, the possible plasticity of these morphological features according to cutural conditions (3,10), and the overlapping of these characteristics among species have moved researchers toward molecular markers as additional criteria for species identification (8,9,12,13).

The purpose of this study is to describe a new species of *Calonectria* from leatherleaf fern based on morphological characterization and molecular markers.

MATERIALS AND METHODS

Morphological Studies

The teleomorph of *C. heptaseptatum* Sobers, Alfieri & Knauss is presently unknown (11). Therefore, attempts to induce perithecia were made.

In 1994, samples of diseased leatherleaf fern were collected in a fernery in Panama. Some of the plants had petiole lesions. Segments of petiole with lesions were surface-sterilized with 0.3% sodium hypochlorite for 3 min and plated on acidified potato dextrose agar (APDA) (12).

To obtain single ascospore cultures of the fungus from Panama, perithecia were picked with sterile forceps and transferred to a drop of sterile deionized water (SDW) on a flamed slide. To remove conidial and mycelial contamination, perithecia were transferred through a series of individual drops of SDW. A sterile cover glass was placed on top of a drop containing the washed perithecia, and with pressure exerted against the cover glass, separated asci, asci in groups, and free ascospores were extruded. Asci and ascospores were washed off the slide with SDW into a sterile, plastic Petri dish (60 X 15 mm). The suspension was then dispensed onto 1.8% WA in glass Petri dishes (100 X 15 mm), and the excess was poured off.

These plates were incubated at room temperature for a period of 16-20 hr. Small squares of the WA containing single germinating ascospores were cut with a flamed scalpel under the dissecting microscope at X20, and 18 ascopores were transferred to APDA plates for morphology comparison.

The following Florida isolates of *C. heptaseptatum* from leaf spots on leatherleaf fern [*Rumohra adiantiformis* (G. Forst.) Ching] were used in this study: 080-0502, P88-5640, P89-0260, and P91-2044 (Table 1). These isolates were paired in all possible combinations on irradiated segments of carnation (*Dianthus caryophyllus* L.) leaves on water agar (CL/WA) and on irradiated stems of peanut (*Arachis hypogaea* L.) on water agar (PS/WA) to enhance conidium production and promote perithecial formation (23). CL/WA was prepared as described by Fisher *et al.* (15) and PS/WA was prepared by pouring cooled (50°C), autoclaved 1.8% water agar (WA) over dried irradiated pieces of peanut stem (4-6 cm long). Paired cultures were incubated at room temperature (25 ± 2°C) under ambient laboratory conditions and were observed over a 6-week period.

TABLE 1. Origin of the isolates of *Cylindrocladium* spp. studied.

No.	Species	Isolate	Host	Geographic Origin
1	*C. heptaseptatum*	P91-2044	*Rumohra adiantiformis*	Florida, USA
2	*C. heptaseptatum*	P88-5640	*R. adiantiformis*	Florida, USA
3	*C. heptaseptatum*	P89-0260	*R. adiantiformis*	Florida, USA
4	*C. heptaseptatum*	080-0502	*R. adiantiformis*	Florida, USA
5	*C. rumohrae*	P94-3976	*R. adiantiformis*	Volcan, Panama
6	*C. quinqueseptatum*	UFV64a	Unknown	Brazil
7	*C. quinqueseptatum*	ATCC16550	*Scolopendrium* sp.	Solomon Islands

Microscopic examinations and measurements were made on 105 perithecia, 89 asci, 221 ascospores, 77 primary branches, 4 secondary branches, 64 phialides, 166 straight macroconidia, 21 sharply bent macroconidia, 201 microconidia, and 58 vesicles at X100, X400, or X1000. The anamorphs which were derived from the 18 ascospores were also grown on CL/WA and PS/WA. Conidiophore branches, phialides, and vesicles were mounted in water and were measured within 5 min of preparation to avoid swelling and distortion. Conidia were mounted in cotton blue lactophenol and were measured under oil immersion lens at X1000.

Molecular Studies

Fungal growth: Four isolates of *C. heptaseptatum* and two *C. quinqueseptatum* Boedijn & Reitsma cultures were compared to the *Cylindrocladium* sp. under study

(Table 1). These fungi were grown in 125-ml Erlenmeyer flasks containing 50 ml of a semisynthetic liquid medium (1). A 5- mm-diameter mycelial agar plug of each isolate, taken from the margins of actively growing colonies, was transferred to the liquid medium and incubated in the dark for 7 days at 25°C. After incubation, the cultures were filtered, under suction, through a Buchner funnel containing a Whatman No. 1 filter paper. The mycelial cake was rinsed with distilled water and the excess moisture was removed by squeezing the mycelium in the filter paper and weighed out.

Protein extraction and isoenzyme analysis: Two hundred milligrams of mycelium were ground in an ice cold mortar and pestle containing 1 ml of a buffer solution composed of 0.34M dibasic sodium phosphate, 0.2M sucrose, 2.56% PVP-40, 5.7 mM L- ascorbic acid, 5.8 mM DIECA, 2.6 mM sodium bisulphate, 2.5 mM sodium borate, 0.2% β-mercaptoethanol, and 1% polyethylene glycol-6000 (4). Protein extracts were absorbed in 12 X 5 mm chromatographic paper wicks (Whatman 3 MM) and stored in microcentrifuge tubes at -85°C until used. The electrophoresis was conducted on 13% starch gel. Two buffer systems were tested: 1-morpholine-citrate, modified after Clayton and Tretiak (7): (Electrode: citric acid 0.04M, pH 6.1, adjusted with N-(3-aminopropyl) morpholine; Gel: same as electrode buffer, diluted at 1:20 for use, pH 7.1) 2-Tris-borate (19) (Electrode: Tris 0.5M, boric acid 0.65M, EDTA 16 mM; Gel: same as electrode buffer diluted at 1:10 for use, pH 8.0).

Analysis of total soluble SDS- and non SDS-proteins as well as isoesterases was performed on polyacrylamide gels. Protein extraction, electrophoresis, and gel staining were described elsewhere (2,13).

DNA extraction and RAPD analysis: A modification of the cetyltrimethylammonium bromide (CTAB) method was used to prepare DNA as follows: one hundred milligrams of mycelium were homogenized in a pestle and mortar in liquid nitrogen, and the resulting powder was transferred to microcentrifuge tubes containing 700 μl of a preheated (65°C) extraction buffer composed of 2% CTAB, 100 mM Tris-HCl (pH 8.0), 20 mM EDTA, 1.4 M NaCl, and 0.2% β-mercaptoethanol. After 60 min incubation at 65°C, the samples were centrifuged at 12,000 x g for 5 min, and the supernatant was extracted twice with 1 volume of chloroform: isoamyl alcohol (24:1). The water phase was transferred to a new tube and mixed with 2 volumes of precooled ethanol. After 1 hr of incubation at -20°C, the nucleic acid was recovered by centrifugation at 12,000 x g for 5 min. The pellet was washed twice with 1.0 ml of 70% ethanol, air-dried, and dissolved in 200 ml of TE (10 mM Tris-HCl, pH 8.0, 1.0 mM EDTA) containing 50 μg of RNAse/ml of suspension. The pellet was dissolved (2 hr at 4°C) and the samples were incubated for 1 hr at 37°C. The DNA concentration of each sample was estimated by comparing band intensities with known standards of DNA on agarose gel stained with ethidium bromide. Amplification reaction (25), in a total volume of 13 μl, consisted of 7.5 ng of genomic DNA, 0.2 mM each of dNTP, 1 U of Taq polymerase, 10 mM Tris pH 8.3, 50 mM KCl, 2 mM $MgCl_2$, and 15 ng of a single decamer primer (Operon Technologies Inc., Alameda, California, USA). Thirty three primers (OPA-1,2,34; OPB-1,10,15,17; OPM-12; OPX-17; OPAA-1,2,3,4,6,10,14,15,17,19; OPAB-3,5,6,9,11,14,19; OPAC-3,5,7,9,10,12,20) were selected for use with all isolates. Reaction mixture without genomic DNA (negative controls) was run with each amplification. Amplification was performed in microplates using a MJ Research thermal cycler programmed for 40 cycles of 1 min at 92°C, 1 min at 35°C, and 2 min at 72°C with the fastest possible transitions between temperatures. A final extension of 72°C for 7 min was programmed following cooling at 4°C until sample recovery. Random Amplified Polymorphic DNA products were analyzed by electrophoresis at 100 V for 5 hr on 1.2% agarose gels in TBE buffer (90 mM Tris-borate, 1 mM EDTA, pH 8.0) stained with ethidium bromide (0.2 μg/ml) and photographed under UV light in a photodocumentation and image system (Eagle Eye II, Stratagene).

Data analysis: The most visible isoenzyme or DNA bands were scored as 1 (presence) or 0 (absence), and these data were used to estimate the genetic distance between pairs of isolates according to Nei & Li (18) Genetic Distance = 1-(2 Nab/Na+Nb), where Nab = bands common to isolates A and B, Na = bands of isolate A, and Nb = bands of isolate B. Genetic distance data were used to obtain cluster analyses using the simple match method.

RESULTS

The 18 cultures which were derived from single ascospores were fairly uniform in colony morphology. All 18 ascospores yielded the *Cylindrocladium* anamorph and were found to be identical to the culture that produced them. The average colony diameter was 27.7 mm after 4 days on APDA at 25±2°C. There were slight differences in growth rate ranging from 25.5 to 30 mm in diameter. All 18 cultures produced macroconidia within 4 days. On CL/WA and PS/WA, all 18 single ascospore cultures and the culture that produced them, revealed, within 3 weeks, the presence of microconidia (Fig. 1E) in addition to the commonly observed macroconidia. Microconidia were mostly (91.5%) nonseptate or had one septum and measured 16.6(7.9-32.2)x3.9(2-5)μm; 5% had two septa and measured 30(27.7-33.7)x4.6(3-5.9)μm; and 3.5% had three septa and measured 39.4(32.7-49)x5.3(5-5.5)μm. Macroconidia were mostly five-septate (Table 3) and were produced within four days on APDA, CL/WA, and PS/WA at room temperature. They measured 106(77.2-132.7)μm in length and 10(8.3-13.9)μm in width. In older cultures (3-4 weeks old), the fungus produced a noticeable number of long, sharply bent macroconidia on CL/WA and PS/WA (Fig. 2), which revealed as many as 13 septa, and measured 150.2(123.8-191.7x11.3(10.5-12.5)μm. Sharply bent macroconidia were also observed in isolates P88-5640 and P91-2044 of *C. heptaseptatum* from Florida and in *C. heptaseptatum* from Honduras (24). Conidiophores arose either from a mycelial cell, terminating in a narrowly clavate vesicle (Fig. 1B) or from a chlamydospore cell (Fig. 1D). Fifty-eight vesicles measured 4.3(3-7.5) μm wide. Chlamydospores produced in older cultures on CL/WA and PS/WA were borne singly, in pairs, in chains (Fig. 1F), or in clusters. Primary branches were mainly (97.4%) nonseptate and a few (2.6%) had one septum. They were 22.3(12.9-41.6)x5.8(4-7.5) μm. Secondary branches were nonseptate and were seldom observed. Only

---

Fig. 1. *Cylindrocladium rumohrae*. A) Portion of conidiophore showing a single central filament and a primary branch bearing two cylindric phialides X640. B) Narrowly clavate vesicle X640. C) Macroconidium showing five septa, and two one-septate microconidia X640. D) Microconidiophore arising from a chlamydospore X640. E) Microconidia X640. F) Chlamydospores in chain X640.

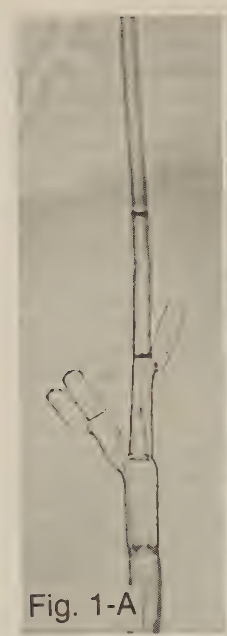


Fig. 1-A

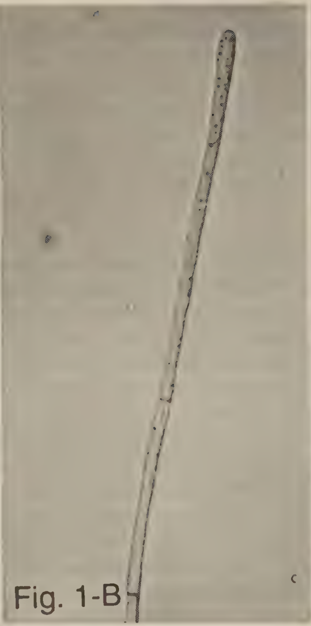


Fig. 1-B

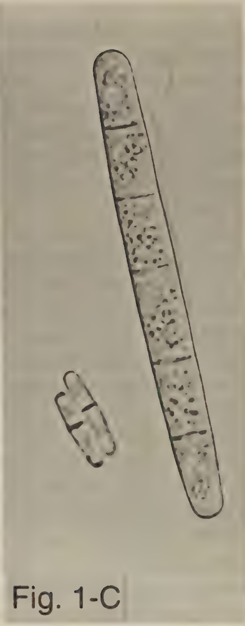


Fig. 1-C

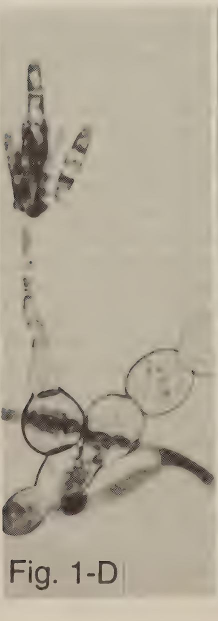


Fig. 1-D

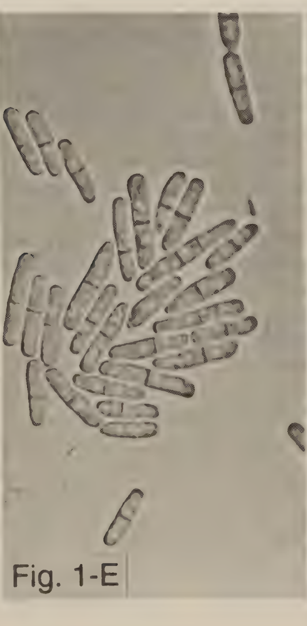


Fig. 1-E

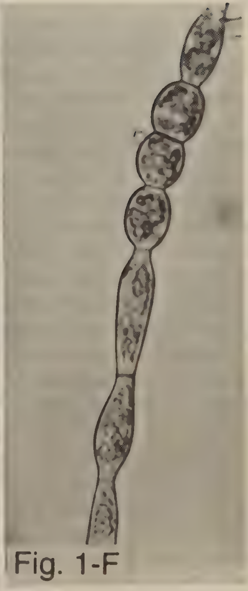


Fig. 1-F

4.9% of secondary branches were observed. They measured 17.8(16.8-18.8)x5.2(4.2-6.4) µm. No tertiary branches were detected. Phialides were hyaline, nonseptate, and cylindric (Fig. 1A) and measured 20(12.9-29.9)x5.5(4-7) µm.

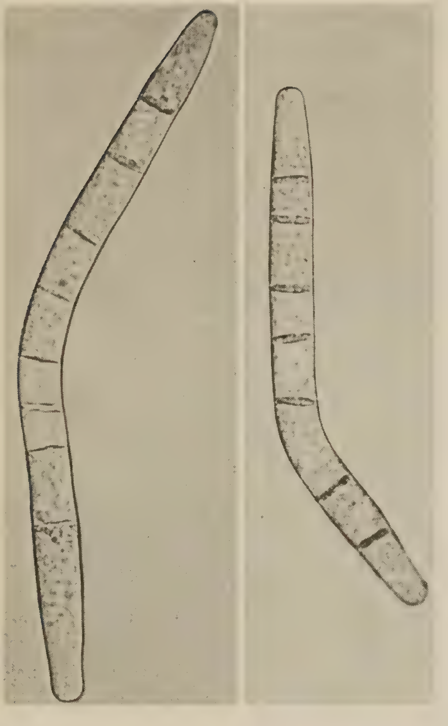


Fig. 2. *Cylindrocladium rumohrae*. Sharply bent macroconidia X640.

The *Cylindrocladium* sp. under study differs from *C. heptaseptatum* and *C. quinqueseptatum* by having wider macroconidia (Table 2). *Cylindrocladium heptaseptatum* (11,24) and the fungus under study have cylindric phialides (Fig. 1A) in contrast with reniform phialides of *C. quinqueseptatum* (5,24). The *Cylindrocladium* sp. under study produces mostly macroconidia with five septa (Fig. 1C) while those of *C. heptaseptatum* mostly have seven septa (Table 3). The fungus under study does not produce tertiary branches, while *C. quinqueseptatum* is known to produce them (5,24).

All 18 single ascospore cultures produced perithecia (Fig. 3 A,B) containing asci (Fig. 3 C,D) and ascospores (Fig. 4) on CL/WA and PS/WA within 3-4 weeks, which establishes the homothallic nature of this fungus. Macroscopic and microscopic characteristics of the perithecia were typical of *Calonectria* (20,21). This teleomorph is different from all known species of *Calonectria* with *Cylindrocladium* anamorphs (11,22). Ascospores with up to nine septa (mostly with three septa) were extruded from perithecia of this isolate from Panama as compared to ascospores with one to six septa (mostly three septa) for *Calonectria quinqueseptata* (14). Ascospores of the isolate under study are longer [97(41.6-160.4) µm] than those of *C. quinqueseptata* (30-80 µm) (14). Individual isolates of *C. heptaseptatum* from Florida (P88-5640, P89-0260 and P91-2044) or in crossings did not produce perithecia on CL/WA or PS/WA.

TABLE 2. Comparative conidial measurements (μm) of *Cylindrocladium rumohrae* from Panama with three *C. heptaseptatum* isolates from Florida, *C. heptaseptatum* type culture from Honduras, and *C. quinqueseptatum* from Indonesia.

		Length Width
Isolate No.	Species	Min. Mean Max. Min. Mean Max.
P94-3976	*Cylindrocladium rumohrae*	(77.2-) 106 (-132.7) X (8.3-) 10 (-13.9)
P88-5640	*Cylindrocladium heptaseptatum*	(70.3-) 91.1 (-112.9) X (5.9-) 6.8 (-7.9)
P89-0260	*Cylindrocladium heptaseptatum*	(74.3-) 93.8 (-114.8) X (5.5-) 6.8 (-7.9)
P91-2044	*Cylindrocladium heptaseptatum*	(93.1-) 122.8 (-150.5) X (6.6-) 7.6 (-8.9)
ATCC 38228	*Cylindrocladium heptaseptatum*	(80.2-) 108.9 (-131.9) X (6.5-) 7.9 (-9.4)
ATCC 16550	*Cylindrocladium quinqueseptatum*	(62.6-) 80.1 (-95.2) X (4.7-) 6.4 (-7.8)
●B.R. No. 31/48	*Cylindrocladium quinqueseptatum*	(75-) NG (-106) X (5-) NG (-7)

●See reference No. 5
NG = Not Given

TABLE 3. Comparison of conidial septation of *Cylindrocladium rumohrae* from Panama to three *Cylindrocladium heptaseptatum* isolates from Florida, *Cylindrocladium quinqueseptatum* from Indonesia and the percentage of conidia in each septation category.

			Conidial septation						
Species	Isolate No.	No. of conidia measured	One septum	Three septa	Four septa	Five septa	Six septa	Seven septa	Eight septa
Cylindrocladium rumohrae	P94-3976	166		0.6%	11.5%	74.1%	12.1%	1.2%	0.6%
Cylindrocladium heptaseptatum	P88-5640	78		2.6%	1.3%	9.0%	25.6%	61.5%	
Cylindrocladium heptaseptatum	P89-0260	69	1.4%	2.9%	1.4%	23.2%	24.6%	46.4%	
Cylindrocladium heptaseptatum	P91-2044	46				10.9%	10.9%	78.3%	
Cylindrocladium quiqueseptatum	B.R. No. 31/48	NG	Three to six septa (mostly five septa)•						

NG = Not Given

•See reference No. 5

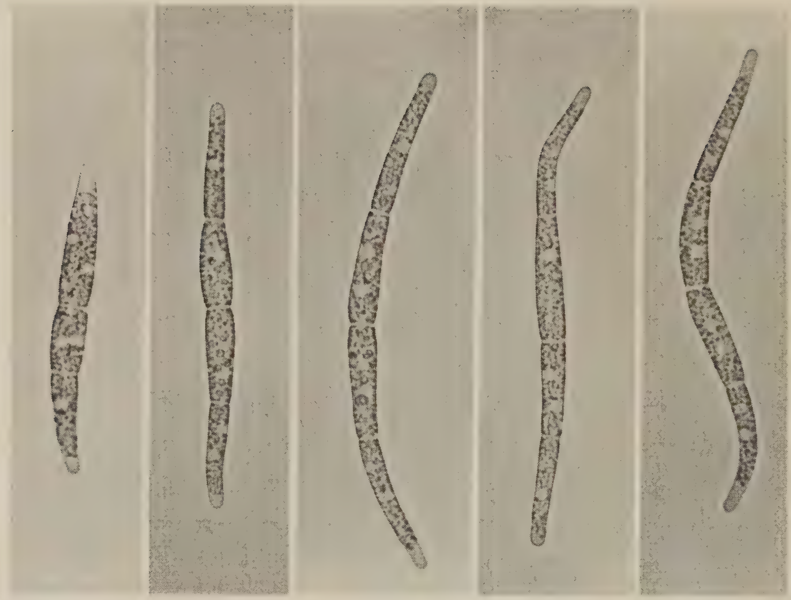


Fig. 4. *Calonectria rumohrae*. Ascospores X640.

Isoenzyme and RAPD analyses: Among 14 enzymes tested, six (α-EST, HK, IDH, MDH, PGM, and 6-PGDH) exhibited good resolution and activity in a gel electrode buffer system N°8 and three (SOD, PGI, and FUM) in buffer system N°11. Six monomorphic and 34 polymorphic isoenzyme bands were detected for all isolates studied (Fig. 5). For RAPD analysis, 33 primers amplified 206 DNA fragments (6.2 fragments/primer). Among these, 10 were monomorphic and 196 were polymorphic (Fig. 6). Monomorphic bands may be useful for fungal identification at the genus level. According to the genetic distance, the isolate under study was somewhat closer to *C. heptaseptatum* than to *C. quinqueseptatum*, although they were all clustered in different groups either by isoenzyme or RAPD analyses, at 80% of the relative genetic distance (Fig. 7).

Based on characteristics of the anamorphic and teleomorphic states and on molecular marker differences, the *Cylindrocladium* isolate from Panama is considered distinct from previously described species and named as follows:

Fig. 3. *Calonectria rumohrae*. A) Perithecia exuding ascospores X28. B) Perithecia in group X28. C) Asci X320. D) Close-up of an ascus X640.

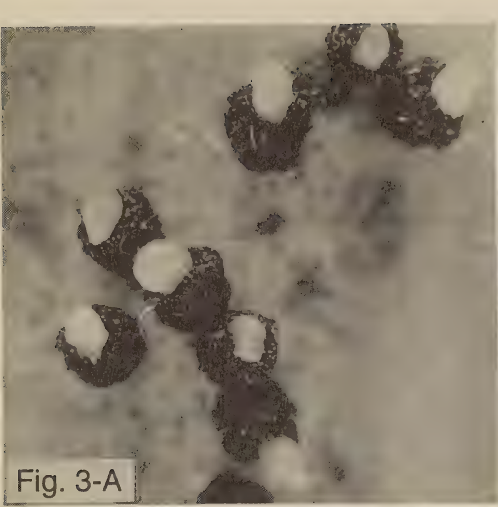


Fig. 3-A

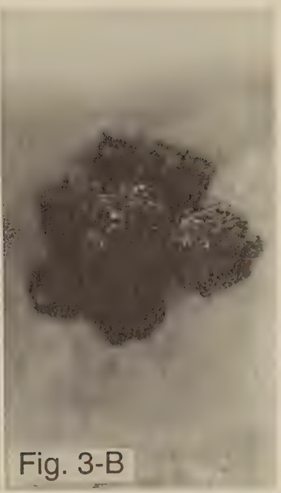


Fig. 3-B

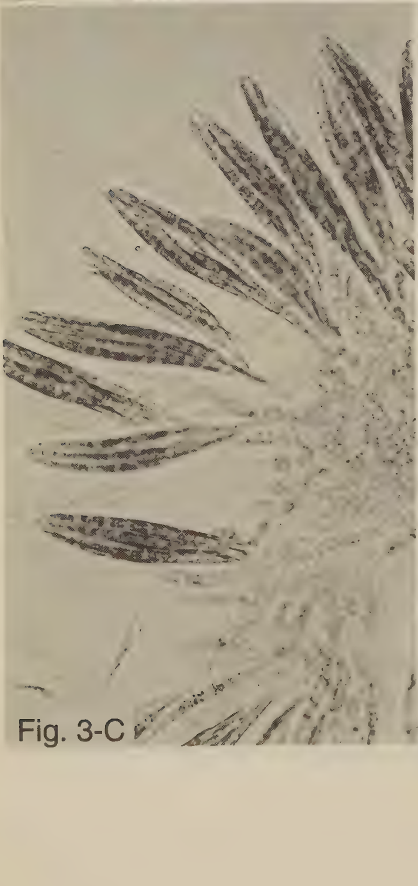


Fig. 3-C

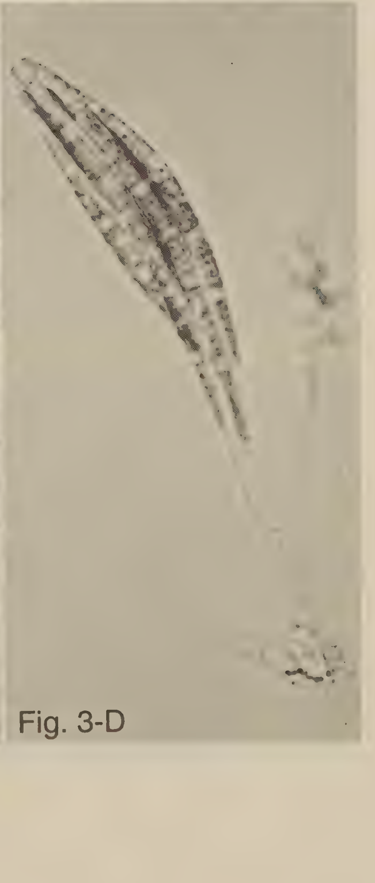


Fig. 3-D

Calonectria rumohrae El-Gholl & Alfenas sp. nov.

Perithecia superficialia, singula vel interdum in gregibus parvis aggregata, aurantio-brunnea ad cinnamomea 495(338-675) µm alta, 409(268-526) µm lata, pariete externo aspero, verrucoso. Asci hyalini, 187(125-217)x18.8(11.3-24.9) µm, 8-spori. Ascosporae hyalinae, rectae curvae vel sinuatae, septis usque ad 9 (plerumque 3), 97(41.6-160.4)x5.9(3.8-8) µm.

Habitatio: Seiuncta e laesionibus petiolaribus *Rumohrae adiantiformis.*

Locus typicus: Volcan, Panama

Holotypus: Teleomorphosis FLAS F56116 ad partes foliorum *Dianthi caryophylli.*

Collectores: J. W. Miller *et* R. M. Leahy.

Datum: Die 20 Septembris 1994.

Calonectria rumohrae El-Gholl & Alfenas sp. nov.

Perithecia orange brown to cinnamon brown, 495(338-675) µm high, 409(268-526) µm wide, with rough, warted outer wall. Perithecia superficial, borne singly or sometimes in small groups. Asci hyaline, 187(125-217)x18.8(11.3-24.9) µm containing 8 ascospores. Ascospores hyaline, straight, curved, or sinuous, with up to 9 septa (mostly 3-septate), 97(41.6-160.4)x5.9(3.8-8) µm.

Habitat: Isolated from petiole lesions on *Rumohra adiantiformis.*

Type locality: Volcan, Panama.

Holotype: Teleomorphosis FLAS F56116, on leaf segments of *Dianthus caryophyllus.*

Collectors: J. W. Miller and R. M. Leahy.

Date: September 20, 1994.

Cylindrocladium rumohrae El-Gholl & Alfenas sp. nov.

Conidiophora in vesiculum hyalinum, anguste clavatum 4.3(3-7.5) µm latum terminantia. Rami primarii plerumque aseptati vel 1-septati, 22.3(12.9-41.6)x5.8(4-7.5) µm. Rami secundarii raro observati, aseptati, 17.8(16.8-18.8)x5.2(4.2-6.4) µm.

Fig. 5. Comparative protein and ∝-isoesterase banding patterns, obtained by polyacrylamide gel electrophoresis. 1-4 = *Cylindrocladium heptaseptatum* (P91-2044, P88-5640, P89-0260, and 080-0502, respectively), 5 = *C. rumohrae*, 6 & 7 = *C. quinqueseptatum* (UFV-64a & ATCC 16550, respectively). A) Sodium dodecyl sulfate (SDS) - protein profiles. B) Non SDS-protein profiles. C) ∝-isoesterase profiles.

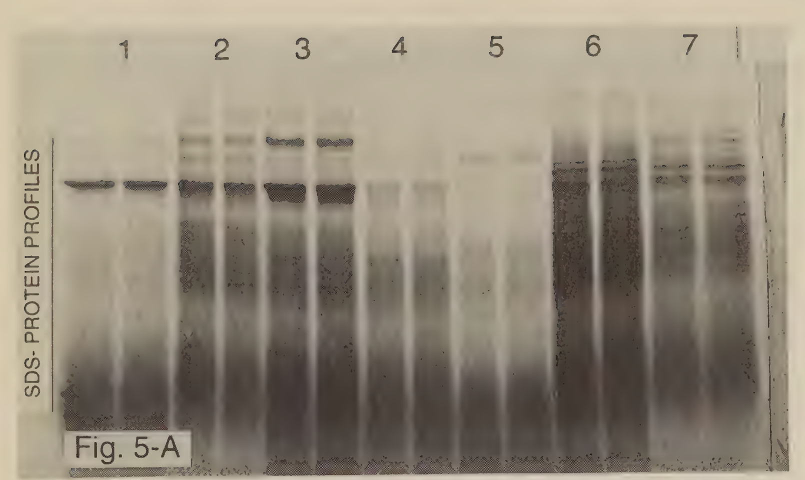

1
2
3
4
5
6
7
SDS- PROTEIN PROFILES

Fig. 5-A

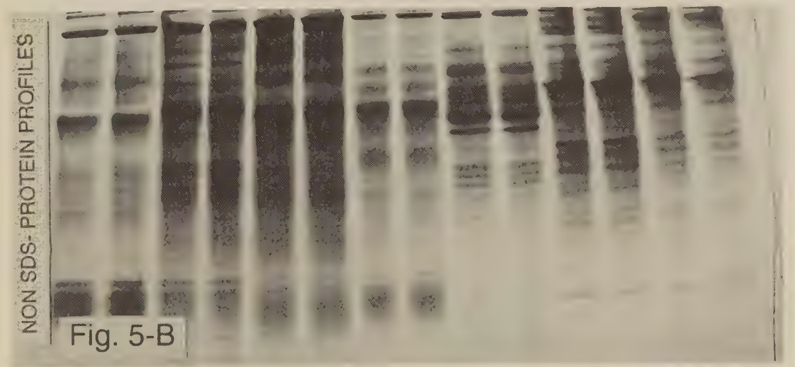

NON SDS- PROTEIN PROFILES

Fig. 5-B

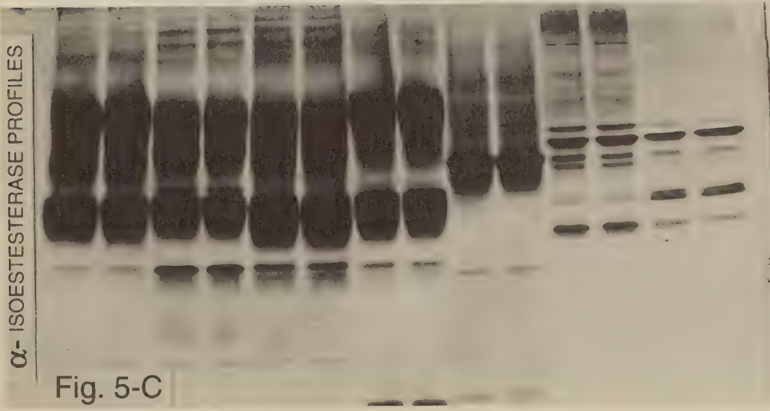

α- ISOESTESTERASE PROFILES

Fig. 5-C

Rami tertiarii absentes. Phialides hyalinae, aseptatae, cylindricae, 20(12.9-29.9)x5.5(4-7) μm. Macroconidia plerumque 5-septata, 106(77.2-132.7)x10(8.3-13.9) μm. Microconidia plerumque aseptata et 1-septata, 16.6(7.9-32.2)x3.9(2-5) μm, raro 2-septata, 30(27.7-33.7)x4.6(3-5.9) μm, vel 3-septata, 39.4(32.7-49)x5.3(5-5.5) μm.

Habitatio: Seiuncta e laesionibus petiolaribus *Rumohrae adiantiformis.*

Locus typicus: Volcan, Panama.

Anamorphosis: ATCC 96731

Collectors: J. W. Miller *et* R. M. Leahy.

Datum: Die 20 Septembris 1994.

Cylindrocladium rumohrae El-Gholl & Alfenas sp. nov.

Conidiophores terminating in a hyaline, narrowly clavate vesicle 4.3(3-7.5) μm wide. Primary branches mostly nonseptate or 1-septate 22.3(12.9-41.6)x5.8(4-7.5) μm. Secondary branches nonseptate and seldom observed 17.8(16.8-18.8)x5.2(4.2-6.4) μm. No tertiary branches. Phialides hyaline, nonseptate, cylindric 20(12.9-29.9)x5.5(4-7) μm. Macroconidia mostly 5-septate 106(77.2-132.7)x10(8.3-13.9) μm. Microconidia mostly nonseptate and 1-septate, rarely 2- or 3-septate. Nonseptate and 1-septate microconidia measured 16.6(7.9-32.2)x3.9(2-5) μm. The 2-septate microconidia were 30(27.7-33.7)x4.6(3-5.9) μm. The 3-septate microconidia measured 39.4(32.7-49)x5.3(5-5.5) μm.

Habitat: Isolated from petiole lesions on *Rumohra adiantiformis.*

Type locality: Volcan, Panama.

Anamorphosis: ATCC 96731

Collectors: J. W. Miller and R. M. Leahy.

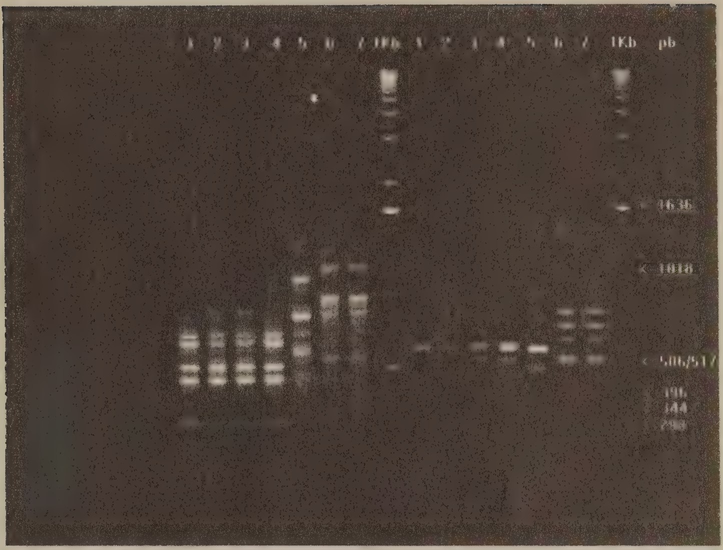
Date: September 20, 1994.

Cylindrocladium rumohrae isolate P94-3976 from Panama was deposited in the American Type Culture Collection, 12301 Parklawn Drive, Rockville, Maryland 20852, U.S.A. as ATCC 96731.

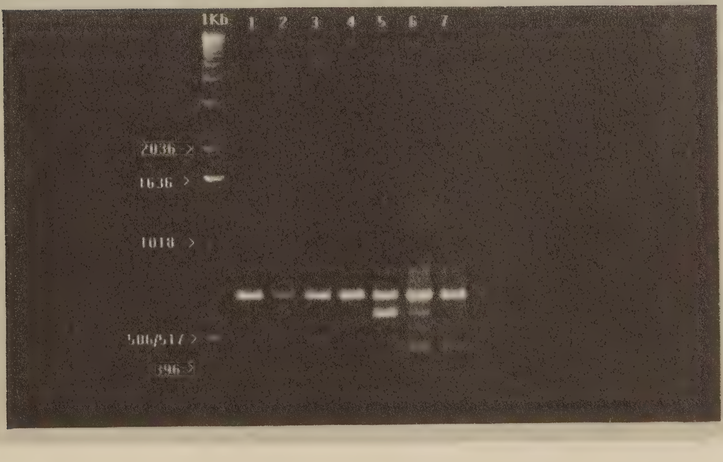
Fig. 6. Typical DNA amplification pattern obtained with OPAB-03, OPAB-05, and OPAA-17 primers for *Cylindrocladium*. 1-4 = *C. heptaseptatum* (P91-2044, P88-5640, P89-0260, and 080-0502, respectively), 5 = *C. rumohrae*, 6 & 7 = *C. quinqueseptatum* (UFV64a & ATCC 16550, respectively).

Fig. 6

OPAB - 3 OPAB - 5


1 2 3 4 5 6 7 1Kb 1 2 3 4 5 6 7 1Kb pb
< 1636
< 1018
< 506/517
396
344
298

OPAA - 17


1Kb 1 2 3 4 5 6 7
2036 >
1636 >
1018 >
506/517 >
396 >

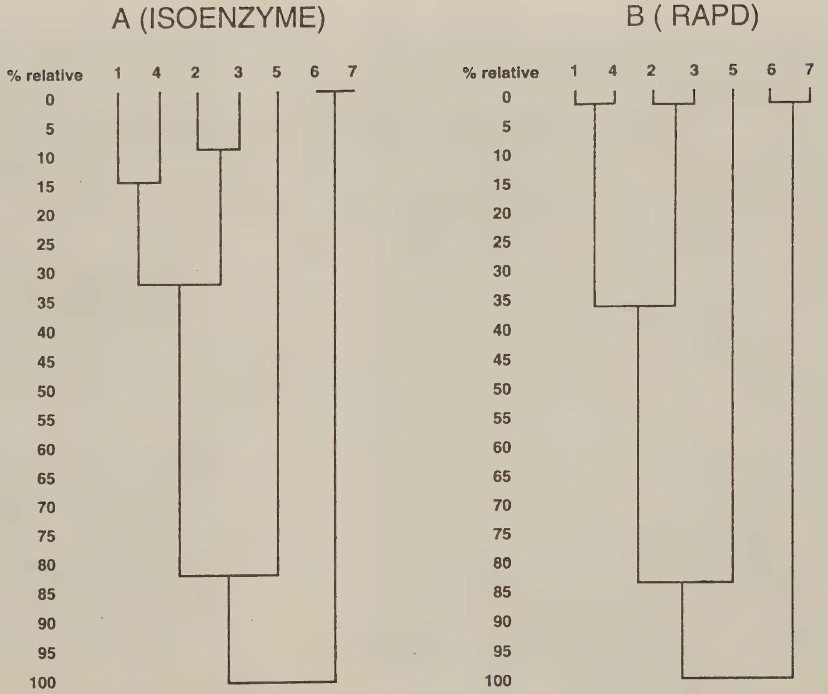


Fig. 7. Dendogram formed by the simple match cluster analysis, illustrating the similarities of seven isolates of *Cylindrocladium* using isoenzyme (A) and RAPD (B) markers. 1- 4 =*C. heptaseptatum*, 5 = C. *rumohrae*, 6 & 7 =*C. quinqueseptatum.*

ACKNOWLEDGMENTS

The authors thank Judy Mattes for typing the manuscript and Mark A. Garland for rendering the Latin description. Thanks are also extended to Professor D. J. Mitchell, Department of Plant Pathology, University of Florida, Gainesville, for his valuable comments and suggestions.

REFERENCES

1. Alfenas, A. C. 1986. Fungos do gênero *Cylindrocladium* como patógenos florestais, no Brasil. Fitopatologia Brasileira 11:275.
2. Alfenas, A. C., Jeng, R. and Hubbes, M. 1984. Isoenzyme and protein patterns of isolates of *Cryphonectria cubensis* differing in virulence. Canadian Journal of Botany 62:1756-1762.
3. Alfenas, A. C., Matsuoka, K., Ferreira, F. A. and Hodges, C. S., Jr. 1979. Identification, cultural characteristics, and pathogenicity of three species of *Cylindrocladium*, isolated from leaves of *Eucalyptus*. Fitopatologia Brasileira 4:445-459.
4. Alfenas, A. C., Peters, I., Brune, W. and Passador, G. C. 1991. Eletroforese de proteínas e isoenzimas de fungos e essências florestais. Sociedade de Investigações Florestais, Universidade Federal de Viçosa, MG, Brasil. 242p.
5. Boedijn, K. B. and Reitsma, J. 1950. Notes on the genus *Cylindrocladium*. Reinwardtia 1:51-60.
6. Bonde, M. R., Peterson, G. L., Dowler, W. M. and May, B. 1984. Isozyme analysis to differentiate species of *Peronosclerospora* causing downy mildews of maize. Phytopathology 74:1278-1283.
7. Clayton, J. W. and Tretiak, D. N. 1972. Amine-citrate buffers for pH control in starch gel electrophoresis. Journal of the Fisheries Research Board of Canada 29:1169-1172.
8. Crous, P. W., Alfenas, A. C. and Wingfield, M. J. 1993. *Calonectria scoparia* and *Calonectria morganii* sp. nov., and variation among isolates of their *Cylindrocladium* anamorphs. Mycological Research 97:701-708.
9. Crous, P. W., Janse, B. J. H., Victor, D., Marais, G. F. and Alfenas, A. C. 1993. Characterization of some *Cylindrocladium* species with three septate conidia using morphology, isozyme banding patterns and DNA polymorphisms. Systematic and Applied Microbiology 16:266-273.
10. Crous, P. W., Phillips, A. J. L. and Wingfield, M. J. 1992. Effects of cultural conditions on vesicle and conidium morphology in species of *Cylindrocladium* and *Cylindrocladiella*. Mycologia 84:497-504.
11. Crous, P. W. and Wingfield, M. J. 1994. A monograph of *Cylindrocladium*, including anamorphs of Calonectria. Mycotaxon 51:341-435.
12. El-Gholl, N. E., Alfenas, A. C., Crous, P. W. and Schubert, T. S. 1993. Description and pathogenicity of *Cylindrocladium ovatum* sp. nov. Canadian Journal of Botany 71:466-470.
13. El-Gholl, N. E., Uchida, J. Y., Alfenas, A. C., Schubert, T. S., Alfieri, S. A., Jr. and Chase, A. R. 1992. Induction and description of perithecia of *Calonectria spathiphylli* sp. nov. Mycotaxon 45:285-300.

14. Figueiredo, M. B. and Namekata, T. 1967. Constatação de *Calonectria quinqueseptata* n. sp., forma perfeita de *Cylindrocladium quinqueseptatum* Boedijn & Reitsma, sôbre *Annona squamosa* L. e *Eucalyptus* sp. Arq. Inst. Biol. Sao Paulo 34:91-96.

15. Fisher, N. L., Burgess, L. W., Toussoun, T. A. and Nelson, P. E. 1982. Carnation leaves as a substrate and for preserving cultures of *Fusarium* species. Phytopathology 72:151-153.

16. Hodges, C. S., Jr., Alfenas, A. C. and Ferreira, F. A. 1986. *Cryphonectria cubensis* and *Endothia eugeniae*. Mycologia 78:343-350.

17. Micales, J. A., Bonde, M. R. and Peterson, G. L. 1986. The use of isozyme analysis in fungal taxonomy and genetics. Mycotaxon 27:405-449.

18. Nei, M. and Li, W. H. 1979. Mathematical model for studying genetic variation in terms of restriction endonucleases. Proceedings of the National Academy of Sciences of the United States of America 76:5269-5273.

19. Poulik, M. D. 1957. Starch gel electrophoresis in a discontinuous buffer system. Nature 180:1477-1479.

20. Rossman, A. Y. 1979. *Calonectria* and its type species, *C. daldiniana*, a later synonym of *C. pyrochroa*. Mycotaxon 8:321-328.

21. Rossman, A. Y. 1979. A preliminary account of the taxa described in *Calonectria*. Mycotaxon 8:485-558.

22. Schubert, T. S., El-Gholl, N. E., Alfieri, S. A., Jr. and Schoulties, C. L. 1989. *Calonectria avesiculata* sp. nov. Canadian Journal of Botany 67:2414-2419.

23. Snyder, W. C. and Hansen, H. N. 1947. Advantages of natural media and environments in the culture of fungi. Phytopathology 37:420-421.

24. Sobers, E. K., Alfieri, S. A., Jr. and Knauss, J. F. 1975. *Cylindrocladium heptaseptatum* sp. nov. on fronds of *Polystichum adiantiforme* from Honduras. Phytopathology 65:331-333.

25. Williams, J. G. K., Kubelik, A. R., Livak, K. J., Rafalski, J. A. and Tingey, S. V. 1990. DNA polymorphisms amplified by arbitrary primers are useful as genetic markers. Nucleic Acids Research 18:6531-6535.

Contribution No. 704, Bureau of Entomology, Nematology and Plant Pathology - Plant Pathology Section, P. O. Box 147100, Gainesville, FL 32614-7100.

Author Index, Volume Sixty-four

Abbasi, M., and Halvor B. Gjærum. Two new species of *Tranzschelia* (Uredinales) on Prunoideae (Rosaceae) from Iran, **64:** 51-55. 1997.

Abraham, T. K., *see* **Vrinda & al.**

Alfenas, A. C., *see* **El-Gholl & al.**

Alfenas, A. C., *see* **Pomella & al.**

Alfenas, Acelino C., *see* **Crous & al.**

Altés, A., *see* **Moreno & al.**

Aptroot, André, *see* **Elix & al.**

Archer, Alan W., *see* **Elix & al.**

Barr, Margaret E. Notes on some 'dimeriaceous' fungi, **64:** 149-171. 1997.

Barreto, R. W., *see* **Pomella & al.**

Barreto, Robert W., *see* **Crous & al.**

Bauer, R., *see* **Vánky & al.**

Bauer, Robert, and Franz Oberwinkler. The Ustomycota: an inventory, **64:** 303-319. 1997.

Begerow, D., *see* **Vánky & al.**

Bigelow, Donna M., *see* **Gilbertson and Bigelow**

Blackwell, Will H., and Martha J. Powell. A taxonomic summary of *Achlyogeton*, **64:** 91-99. 1997.

Boerema, G. H. Contributions towards a monograph of *Phoma* (Coelomycetes)–V. Subdivision of the genus in sections, **64:** 321-333. 1997.

Boshoff, Sanette, *see* **Sinclair & al.**

Bushnell, Welles, *see* **Trappe & al.**

Cano, J., *see* **Castañeda Ruíz & al.**

Castañeda Ruíz, R. F., J. Cano, and J. Guarro. Notes on conidial fungi VI. *Menisporopsis*, **64:** 335-342. 1997.

Castañeda Ruíz, R. F., J. Guarro, and M. J. Figueras. Notes on conidial fungi. XV. *Monodictys bicolorata*, sp. nov., **64:** 189-193. 1997.

Castellano, Michael A., *see* **Domínguez de Toledo and Castellano**

Castellano, Michael A., *see* **Trappe & al.**

Colgan, Wes, III, and James M. Trappe. NATS truffle and truffle-like fungi 7: *Tuber anniae* sp. nov. (Ascomycota), **64:** 437-441. 1997.

Crous, Pedro W., Acelino C. Alfenas, and Robert W. Barreto. Cercosporoid fungi from Brazil. 1., **64:** 405-430. 1997.

Dai, Yu-Cheng, and Tuomo Niemelä. Changbai wood-rotting fungi 6. Study on *Antrodiella*, two new species and notes on some other species, **64:** 67-81. 1997.

Desjardin, Dennis E., Roy E. Halling, and Brian A. Perry. *Gymnopus villosipes* – a common collybioid agaric from California, **64:** 141-147. 1997.

Domínguez de Toledo, Laura S., and Michael A. Castellano. First report of *Gastrosporium simplex* (Gasteromycetes) from South America, **64:** 443-448. 1997.

Eicker, A., *see* **Sinclair & al.**

El-Gholl, N. E., A. C. Alfenas, D. T. Junghans, T. S. Schubert, J. W. Miller, and R. M. Leahy. Description of *Calonectria rumohrae* sp. nov. (anamorph = *Cylindrocladium rumohrae* sp. nov.), **64:** 467-484. 1997.

Elix, John A., André Aptroot, and Alan W. Archer. The lichen genus *Pertusaria* (lichenised Ascomycotina) in Papua New Guinea and Australia: twelve new species and thirteen new reports, **64:** 17-35. 1997.

Evrard, Pierre, *see* **Robert & al.**

Fakirova, Violeta I. *Mycosphaerella pulmonariae* sp. nov. from Bulgaria, **64:** 465-466. 1997.

Figueras, M. J., *see* **Castañeda Ruíz & al.**

Gené, J., *see* **Mercado-Sierra & al.**

Gerber, Alexandra Lehmkuhl, *see* **Loguercio Leite and Gerber**

Gilbertson, R. L., and Sam Ristich. *Oligoporus rennyi* in North America, **64:** 349-352. 1997.

Gilbertson, Robert L., and Donna M. Bigelow. Notes on *Wolfiporia dilatohypha* in North America, **64:** 353-359. 1997.

Gjærum, Halvor B., *see* **Abbasi and Gjærum**

Goos, R. D. Fungi of Barro Colorado Island, adjacent Panama, and the Cali region of Colombia, **64:** 375-383. 1997.

Guarro, J., *see* **Castañeda Ruíz & al.**

Guarro, J., *see* **Mercado-Sierra & al.**

Guerrero, Rosa Trinidad, *see* **Hamme and Guerrero**

Halling, Roy E., *see* **Desjardin & al.**

Hamme, Maria Sirlei, and Rosa Trinidad Guerrero. *Xylaria pseudoapiculata* and *Xylaria montagnei*: two new taxa from south Brazil, **64:** 195-202. 1997.

Hennebert, Grégoire L., *see* **Robert & al.**

Heredia Abarca, Gabriela, Julio Mena Portales, Angel Mercado Sierra, and Manuela Reyes Estebanez. Tropical hyphomycetes of Mexico. II. Some species from the tropical biology station "Los Tuxtlas," Veracruz, Mexico, **64:** 203-223. 1997.

Hjortstam, Kurt, and Leif Ryvarden. Corticioid species (Basidiomycotina, Aphyllophorales) from Colombia collected by Leif Ryvarden, **64:** 229-241. 1997.

Illana, C., *see* **Moreno & al.**

Ju, Yu-Ming, *see* **Rogers & al.**

Junghans, D. T., *see* **El-Gholl & al.**

Kreisel, H., *see* **Moreno & al.**

Leahy, R. M., *see* **El-Gholl & al.**

Lin, Suh-Jen, *see* **Wu and Lin**

Lizárraga, M., *see* **Moreno & al.**

Loguercio Leite, Clarice, and Alexandra Lehmkuhl Gerber. Non-pileate polypores on Santa Catarina Island, SC, Brazil, **64:** 285-301. 1997.

Losi, Cristiano. Macrofungus flora of the Lagoon of Venice and adjacent areas (Italy). Non-gilled basidiomycetes. I. Tomentelloid fungi, **64:** 243-259. 1997.

Lumbsch, H. Thorsten. *Bulbothricella amazonensis* is a polysporous member of *Bulbothrix* (Parmeliaceae), **64:** 225-228. 1997.

Mathew, Sibi, *see* **Vrinda & al.**

Meijer, André A. R. de, *see* **Roberts and Meijer**

Mena Portales, Julio, *see* **Heredia Abarca & al.**

Mercado-Sierra, A., J. Gené, and J. Guarro. Some Costa Rican hyphomycetes II., **64:** 7-15. 1997.

Mercado Sierra, Angel, *see* **Heredia Abarca & al.**

Mesquita, J. B., *see* **Pomella & al.**

Miller, J. W., *see* **El-Gholl & al.**

Mohammed, C., *see* **Yuan and Mohammed**

Moreno, G., A. Altés, and H. Kreisel. Confirmation of the presence of *Dictyocephalos attenuatus* (Gasteromycetes) in Europe, **64:** 393-399. 1997.

Moreno, G., M. Lizárraga, and C. Illana. *Metatrichia horrida* (Myxomycetes), and African species in the Baja California Peninsula (Mexico), **64:** 385-392. 1997.

Niemelä, Tuomo, *see* **Dai and Niemelä**

Oberwinkler, Franz, *see* **Bauer and Oberwinkler**

Orsenigo, Mario. The P. A. Saccardo Mycological Herbarium. A critical revision of the 1930's edition of the catalogue by G. Gola. I – Eubacteria, Dictyosteliomycota, Myxomycota, Plasmodiophoromycota, **64:** 101-139. 1997.

Osorio, Héctor S. Contribution to the lichen flora of Brazil. XXXII. *Pseudocyphellaria intricata* new to Brazil, **64:** 37-38. 1997.

Pando, Francisco. A new species and a synonymy in *Echinostelium* (Myxomycetes), **64:** 343-348. 1997.

Perry, Brian A., *see* **Desjardin & al.**

Pomella, A. W. V., R. W. Barreto, A. C. Alfenas, and J. B. Mesquita. *Asteromidium tabebuiae-impetiginosae* sp. nov. causing a leaf spot disease of *Tabebuia impetiginosa* in Brazil, **64:** 83-89. 1997.

Powell, Martha J., *see* **Blackwell and Powell**

Pradeep, C. K., *see* **Vrinda & al.**
Reyes Estebanez, Manuela, *see* **Heredia Abarca & al.**
Ristich, Sam, *see* **Gilbertson and Ristich**
Robert, Vincent, Pierre Evrard, and Grégoire L. Hennebert. BCCM™/Allev 2.00 an automated system for the identification of yeasts, **64:** 455-463. 1997.
Roberts, Peter, and André A. R. de Meijer. Macromycetes from the State of Paraná, Brazil. 6. Sirobasidiaceae & Tremellaceae, **64:** 261-283. 1997.
Rogers, Jack D., Yu-Ming Ju, and Felípe San Martín. *Jumillera* and *Whalleya*, new genera segregated from *Biscogniauxia*, **64:** 39-50. 1997.
Ryvarden, Leif. *Podoscypha warneckeana*, **64:** 401-403. 1997.
Ryvarden, Leif, *see* **Hjortstam and Ryvarden**
San Martín, Felípe, *see* **Rogers & al.**
Schubert, T. S., *see* **El-Gholl & al.**
Sinclair, R. C., Sanette Boshoff, and A. Eicker. *Sympodioplanus*, a new anamorph genus from South Africa, **64:** 365-374. 1997.
Trappe, James M., Welles Bushnell, and Michael A. Castellano. NATS truffle and truffle-like fungi 6: *Stephensia bynumii* sp. nov. (Ascomycota), with a key to the species of *Stephensia*, **64:** 431-435. 1997.
Trappe, James M., *see* **Colgan and Trappe**
Vánky, K., R. Bauer, and D. Begerow. *Fulvisporium*, a new genus of Ustilaginales, **64:** 57-66. 1997.
Vrinda, K. B., C. K. Pradeep, Sibi Mathew, and T. K. Abraham. *Inocybe purpureoflavida* sp. nov. (Corticiaceae) from Western Ghats of Kerala State, India, **64:** 1-6. 1997.
Wang, Zheng, *see* **Zhuang and Wang**
Wu, Chi-Guang, and Suh-Jen Lin. Endogonales in Taiwan: a new genus with unizygosporic sporocarps and a hyphal mantle, **64:** 179-188. 1997.
Wu, Sheng-Hua. Two new combinations: *Amylofungus globosporus* and *Gloeomyces moniliformis*, **64:** 361-364. 1997.
Yuan, Zi Qing, and C. Mohammed. *Therrya eucalypti* sp. nov. on stems of eucalypts from Tasmania, Australia, **64:** 173-177. 1997.
Zhuang, Wen-ying, and Zheng Wang. Notes on Sclerotiniaceous fungi on *Castanea* and *Castanopsis* in Asia, **64:** 449-454. 1997.

ERRATA

VOLUME SIXTY-ONE

Page 19, line 19	for *Pernospora*	read *Peronospora*
Page 501	for *Gyromitra esculaenta*	read *Gyromitra esculenta*
Page 508	for *Pernospora obliqua*	read *Peronospora obliqua*

VOLUME SIXTY-TWO

Page 380, line 4	for ***& inopatagonicus***	read ***and inopatagonicus***
Page 502	for *Boedijnopeziza institia*	read *Boedijnopeziza insititia*
Page 503	for *Cookeina institia*	read *Cookeina insititia*
Page 508	for *Inocybe brunnea insignior*	read *Inocybe brunnea* f. *insignior*
Page 510	for *Neosartorya fischeri* var. *fiescheri*	read *Neosartorya fischeri* var. *fischeri*
Page 510	for *Peziza institia*	read *Peziza insititia*

VOLUME SIXTY-FOUR

Page 205, line 13	for *Acrodyctis*	read ***Acrodictys***
Page 205, line 24	for *Acrodyctis*	read ***Acrodictys***
Page 206, line 6	for *Acrodyctis*	read ***Acrodictys***
Page 344, line 21	for *E. E. coelecephalum*	read *E. coelocephalum*
Page 344, line 40	*for* on were the	*read* on where the
Page 379, line 37	*for* Saccaardo	*read* Saccardo

INDEX TO FUNGOUS AND LICHEN TAXA, VOLUME SIXTY-FOUR

This index includes names of genera, infrageneric taxa, species, and infraspecific taxa, as well as new names of suprageneric taxa. All new names are in CAPITALS. The page number on which a new name is proposed is followed by an asterisk (*). Attention is drawn to the Index to Saccardo's herbarium by Mario Orsenigo on pp. 101-139, which is not re-indexed here.

Acanthophiobolus 151, 157
  helicosporus 151
  helminthosporus 151
Acanthostigma 151, 157, 167
  erysiphoides 166
  occidentale
    var. minor 166
  parasitica 167
  perpusillum 151
Acanthostigmella 151, 158
  genuflexa 151
Acanthostoma 151
  wattii 151
Acarothallium 151
  hansfordii 151
Acaulospora 184, 186
Achlya 91-92, 96
Achlyogeton 91-97
  entophytum 91-95, 97
  rostratum 93, 95
  rostratus 97
  salinum 94
  salinus 97
  solatium 93, 97
Acrodictys
  elaeidicola 205
  globulosa 205
  queenslandica 206
Agaricostilbum 308
Aleurocystis
  magnispora 230
Amaurodon 237
  viridis 237
Amylofungus 362
  corrosus 362
  GLOBOSPORUS 361-362*, 364
Anomoporia 67
Antennulariella 152, 158
  fuliginosa 152
Anthostoma
  hypophlaeum 45
  microplacum 48
Anthostomella 41
Antrodia
  albida 285-287
Antrodiella 67-69, 72-73, 76-78
  ALBOCINNAMOMEA 67-68, 70*-73
  americana 67-68, 77
  aurantilaeta 72-73
  citrinella 67, 72-73, 78
  faginea 68, 73
  fissiliformis 76-77
  hoehnelii 76-77
  incrustans 72-73
  minutispora 76-77
  murrillii 77
  parasitica 68, 72-73
  semisupina 67, 76, 79
  subcrassa 73
  thompsonii 68, 73
  USSURII 67-68, 74*-77
Aphanostigme 152, 154, 157, 166
  lanugine 167
  solani 152, 166
Aposphaeria 326
Arthrinium
  phaeospermum 206
Asbolisia 160
Ascochyta 324-326
  Sect. Phyllostictoides 323, 331
  althaeina 331
Asterina
  crustacea 150
Asteromella 324-325
Asteromidium 83-85, 88
  imperspicuum 84-85, 88
  secundum 84, 88
  tabebuiae 85, 88
  TABEBUIAE-IMPETIGINOSAE 83, 84*-85, 87-88
Asteromyxa 152
  hirtula 152
Asterostroma
  muscicola 230
Astiothyrium 152
  hymenaeae 152
Astrosporina
  corneri 5
Atelopsis
  lembospora 230
Athelia
  decipiens 230
  epiphylla 230
Atractiella 303-304, 308
Atractogloea
  stillata 309, 311
Aurantiosporium 57, 61-62
  subnitens 58, 61, 65
Auricularia 309

Battarrea 398
  attenuata 394
Battarreoides 398
Bauhinus 304, 312-313

Beltrania
    rhombica 218
Bicricium 94-95
Biscogniauxia 39-42, 48
Bjerkandera
    adusta 359
    fumosa 359
Boidinia 361
Bolosphaera 152
    degenerans 152
Botryobasidium 240
    asterosporum 231
    lembosporum 230
Botryohypochnus 231
    biapiculatus 231
    bisporum 231
    bondarcevii 231
    hebelomatosporus 231
    isabellinus 231
    SCABERULUS 229-230*, 231
    verrucisporus 229, 231
Brachysporiella
    gayana 9, 11
Brevicellicium
    exile 232
    molle 232
Bryochiton 152, 163
    monascus 152
Bryomyces 152, 163
    scapaniae 152
Bulbothricella 225-227
    amazonensis 225-226
Bulbothrix 225-227
    amazonensis 227
Bulleromyces
    albus 459
Byssomerulius
    corium 232

Calochaetis 152
    indica 152
Calonectria 166, 468, 473
    quinqueseptata 473
    RUMOHRAE 467-468, 476, 478*
Calvatia
    defodiodis 444
Camptobasidium 303
    hydrophilum 308-309
Candelabrochaete
    dispar 232
Candida
    albicans 459
    apis 459
    boidinii 459
    bombicola 459
    castellii 459
    castrensis 459
    catenulata 459
    edax 459
    glabrata 459
    inconspicua 459
    mesenterica 459
    nitratophila 459
    parapsilosis 459
    pinus 459
    quercuum 459
    rugopelliculosa 459
    rugosa 459
    sake 459
    sorboxylosa 459
    tropicalis 459
    vini 459
    zeylanoides 459
Capnobatista 152, 158
Capnodinula 152
Capronia 166
Catenosubulispora 366, 370, 372
Ceratosperma 152
    theobromae 152
Ceratosporella
    deviata 11
Cercoseptoria 422
    tibouchinae 422
Cercospora 369, 405-408, 428
    arrabidaeae 408
    artanthes 416
    atra 412, 414
    bixae 418
    campinensis 410
    ceibae 406
    colubrinae 411
    diospyri 412
    eugeniae 426, 428
    fuligniosa 412, 414
    fulignosa 414
    glauciana 406
    luheae 415
    mamaonis 407-408
    micranthae 420
    papayae 407-408
    peixotoae 423
    psidii 421
    punicae 421
    pyrostegiae 416
    rubida 425
    sawadae 421
    tibouchinae 422
    ubatubensis 414
    urenae 423
    vicosae 414
    xylopiae 408
Cercosporina
    sphaerellae eugeniae 426, 428
Cerinomyces 240
Ceriporia 288
    mellea 285-286, 288
    reticulata 288
    xylostromatoides 285-286, 289
Ceriporiopsis
    carnegiae 359
    pannocincta 285-286, 290
Cerocorticium 239
Cerrena
    unicolor 78

Chaetopsina
  ludoviciana 338
Chaetosticta
  perforata 166
Chaetostigme 152
  melioloides 152
Chaetostigmella 152
  papillifera 152
Chaetyllis 153
  polonica 153
Chalara
  brachyspora 11
Chevalieropsis 150
Chikaneea 366, 371-372
Chilemyces 153
  valparadisiacus 152
Chionosphaera 308
Chlamydopus 398
  meyenianus 398
Ciboria
  americana 449
  GLAUCESCENS 449*
Cicinnobella 160
Circinotrichum
  fertile 211
  papakurae 206
Cladobotryum
  sphaerocephalum 375-376, 382
Colacogloea 306, 311
Collybia 141
 Subg. Rhodocollybia 141-142
 Sect. Subfumosae 146
  biformis 146
  fuscopurpurea 142
  tuberosa 141
Conferticium 361
Coniothyrium 325
Cordana
  abramovii 11
Corticium
  rickii 239
Coryne 167
  purpurea 167
Corynespora
  cassiicola 207
  gigaspora 207
  siwalika 207
Corynesporopsis
  isabelicae 11
  rionensis 208
Craterellus
  dongolensis 401-402
Creosphaeria
  sassafras 41
Cryptococcus
  albidus
   var. albidus 459
  curvatus 459
  laurentii 459
  terreus 459
Cryptomycocolax
  abnorme 305
  pallescens 11
Cylindrobasidium
  torrendii 232
Cylindrocladium 467-469, 471, 473, 476, 480, 482
  heptaseptatum 467-469, 471, 473-476, 478, 480, 482
  quinqueseptatum 467, 469, 473-476, 478, 480, 482
  RUMOHRAE 467-469, 471, 473-475, 478*, 480, 482
Cylindrosympodium 366, 369, 372

Dacrymyces
  rubro-fuscus 262, 264
Dekkera
  anomala 459
Dendrophora
  albobadia 232
Dendrothele
  cyatheae 232
  mexicana 232
Dendryphion
  comosum 218
Dentipellis
  dissita 232
Deuterophoma 323
Diatrype
  hypophlaea 45-46
  microplaca 48
  stigma 43
Dichaetis 153
  javanicus 153
Dichomitus
  anoectoporus 285-286, 290-291
Dichostereum
  effuscatum 232
Dictyocephalos 398
  attenuatus 393-396, 398
  curvatus 394
Dictyochaeta
  lunulospora 208
Dictyosporium
  heptasporum 218
  subramanianii 11
Dictyotrichiella 166
Didymella 321, 323-324, 327, 330-332
Dimeriella 151-153, 157-159
  hirtula 153
  lichenicola 164
Dimeriellopsis 153, 166
  costaricensis 153, 166
Dimerina 153, 156-157
  andirae 153
  strychni 153
Dimerinopsis 153
  luzonenis 153
Dimeriopsis 153
  arthrostylicola 153
Dimerium 150-151, 153, 156-157, 159-160
  olivaceum 151, 153
  pulveraceum 150, 153

Dimerosporium 150
    ctenotrichum 150
    occultum 150-151
    langloisii 160
    pangerangense 150
    parvulum 150
    tasmanicum 150
Diploplenodomus 323
Disciseda
    defodiodis 444
Donkia
    pulcherrima 353
Drepanospora
    pannosa 13

Echidnodella
    crustacea 150
Echinostelium 343-344
    apitectum, 343-344, 346-347
    brooksii 344
    coelocephalum 344
    colliculosum 344
    LADOI 343*-344
    paucifilum 344
    vanderpoelii 343-344, 346-347
Echinothecium 153, 158
    reticulatum 153
Ectosticta 160
Elmerina
    caryae 285-286, 291-292
Endogone 179-181, 187
    lactiflua 184
Eocronartium 305
Epibryon 154, 163
    plagiochilae 154
Epicoccum 323-324, 329, 331
Epiploca 154, 162
    andromedae 154
Epipolaeum 153-155, 157, 162, 165
    absconditum 162
    gallicum 164
    irradians 154
    sulcicola 162
Episoma 154
    parasiticum 154
Episphaerella 154, 158-159
    dodonaeae 159
    manihotis 154, 159
Eudimeriolum 149, 151-152, 154-155, 158, 160, 166
  Subg. Setocarpum 160, 165
    ANDROMEDAE 149, 160, 162*
    dissemination 162
    elegans 154, 162
    hirtuloides 162
    liabi 162
    PLANTAGINIS 149, 160, 162*
    pumilum 162
    septentrionale 162
    tsugae 158
Eumela 151, 154, 158-159
    chiococcae 154, 159
Eutypella 264
Exidia
    nucleata 276
Exobasidium 304, 309-310
Exosporium
    ampullaceum 209
    monanthotaxis 209
    pterocarpi 209
Exserticlava
    triseptata 208

Farysia
    olivacea 305
    thuemenii 305
Filobasidiella
    neoformans 459
Flaviporus 68-69
    subhydrophilus 77
Flavodon 69
    flavus 69
Fomitopsis
    pinicola 72, 78
FULVISPORIUM 57, 59*, 61
    RESTIFACIENS 59*-62, 64-65
Fusariella 376
    concinna 375-377, 380

Ganoderma
    australe 252
Gastrosporium 443
    beccarianum 444
    simplex 443-444, 446
Geniculosporium 39-42, 44-45, 48
Geopora 434
Gibbera 150
  Subg. Xenogibbera 154, 157
    irradians 154
    volkartiana 165
Gloeocystidiellum 361-362
Gloeodontia
    pyramidata 232
Gloeomyces 361, 363
    ginnsii 363
    graminicola 363
    MONILIFORMIS 361, 362*-364
Gloeophyllum
    protractum 78
Gloiothele 361-362
Gomezina 154
    araguata 154
Gonytrichum
    chlamydosporum
      var. simile 13
Graphiola 310
Graphium
    calicioides 13, 210
    penicilloides 377
Gymnopus 141-142
    biformis 146
    VILLOSIPES 141, 142*-143, 146
Gyrothrix
    podosperma

[Gyrothrix] verticiclada 210

Hanseniaspora
    uvarum 459
Harknessiella 167
Harpographium
    fasiculatum 377
Helicobasidium 304, 311
Helicogloea 303, 308
Helicomyces
    roseus 13, 378
Helicosporium
    griseum 13
    nematosporum 13
    virescens 13
Hemitrichia 390
Hermatomyces 189
    dimorphus 190
    sphaericum 13-14, 211
Herpobasidium 304-306, 311
    filicinum 311
Herpotrichia 167
    parasitica 167
Heterogastridium 306
Heteromycophaga 270, 272
Hyalomeliolina 154, 158, 166
    costaricensis 166
    guianensis 154
Hydnum
    viride 237
Hymenochaete 77, 240
Hyphoderma
    argillaceum 232
    heterocystidium 232
    litschaueri 232
    pallidum 233
    praetermissum 233
    puberum 233
    rude 233
    setigerum 233
Hyphodermella
    corrugata 233
Hyphodontia 229, 233, 237, 299
    agglutinospora 233
    alutaria 233, 237
    apacheriensis 233
    arguta 237
    brevidens 233
    breviseta 233-234
    candidissima 233
    crustoglobosa 234
    crustosa 233-235
    detritica 234
    HASTIFER 229, 234*
    juniperi 233-237
    pallidula 237
    RUDIS 229, 235*-236
    STRATOSA 229, 233-234, 236*-237
    VERECUNDA 229, 237*
    writhtii 237
Hypomyces
    albidus 376
    cinereum 43, 45
    griseum 43
    hypophlaeum 45, 48
    maculatum 49
    microplacum 49

Idriella
    fertillis 211
Inocybe 1
  Sect. Marginatae 5
    PURPUREOFLAVIDA 1, 3*, 5
Inonotus
    radiatus 76
Irpex 69
    lacteus 69

Jola 311
JUMILLERA 39-41*, 44, 47-48, 50
    ALBIDA 39, 42*-43, 45
    CINEREA 39, 42, 43*-45, 47-48
    HYPOPHLAEA 39, 42, 45*
    MEXICANA 39, 42, 44-46*, 47
    PUNCTATOBRUNNEA 39, 42, 47*
    VIRIDIS 39, 42, 47*
Junghuhnia 68-69, 72
    conchiformis 79
    microspora 292
    polycystidifera 285-286, 292-293
    vincta 285-286, 293-294

Kneiffia
    candidissima 233
Kriegeria 311
Kurtzmanomyces
    nectarii 459

Lagenidium 92
Lambertella 451, 453
    buchwaldii 450-451
    OBPYRIFORMIS 449-450*, 451
Lanzia 453
    CASTANOPSIDIS 449, 451*-453
    huangshanica 453
      f. aurantiaca 454
      f. huangshanica 453-454
Lasiosphaeria
    garryae 167
Lasiosphaeris 155
Lasiostemma 152, 154-155, 157-159, 162-163
  Subg. Lasiostemma 159
  Subg. Setostemma 159
    cordiicola 159
    erysipheoides 159
    irradians 159
    maesae 159
    melioloides 150, 154, 159
    minutum 159
Lasiostemmella 154
    sydowii 154
Lazulinospora 237
    wakefieldiae 229, 237

Lepidomyces
    subcalceus 232
Leptomeliola 154, 157-158
    cryptocarpa 156
    cymbisperma 154
    hyalospora 154
Leptophoma 323
Leptoporus
    duracinus 77
Leptosphaeria 321, 323-324, 326-327, 332
    maculans 332
Leucorrhizon
    nidificum 444
Leucosporidium 306
    scottii 308
Libertella 39-44, 47-48
Lindtneria
    chordulata 229, 237
Liroa 62
Litschaurella
    clematitis 238
Lizonia 155, 157-158, 162
    baldinii 162
    emperigonia 155
Lopadostoma 41
  Subg. Anthostomopsis 41
    polynesium 41
    pouzarii 41
    turgidum 41
      var. minus 41

Maireella 150
    tasmanicum 153
Marasmius 141
    villosipes 141-142
Masoniomyces
    claviformis 211-212
Megalocystidium 361
Megasporoporia
    cavernulosa 285-286, 294-295
    hexagonoides 294
Melanelia 227
Melanocephala
    triseptata 13-14, 212
Meliolaster 155
Meliolina 155, 157-158
    cladotricha 155
Meliolinopsis 155, 157
    octospora 155
Melzerodontia
    aculeata 238
    RASILIS 229, 238*
Memnoniella
    subsimplex 212
Menisporopsis 335, 338, 340-341
    ludoviciana 338
    novae-zelandiae 338, 340-341
    pirozynskii 335-338, 340-341
    pleiosetosa 338, 340-341
    profusa 338, 340-341
    theobromae 218, 338, 340-341
Metatrichia 390
    floriformis 390
    floripara 390
    horrida 385, 387, 390
    paragoga 390
    rosea 390
    vesparium 385, 387, 390
Metschnikowia
    pulcherrima 459
Microbotryum 57, 62, 304, 312-313
    violaceo-irregulare 313
    violaceum 65
Microcollybia 141
Microsphaeropsis 324-325
Mirandia 155
    cordiicola 155
Moellerodiscus
    glaucescens 449-450
Mollisia 314
Monodictys 189-190
    BICOLORATA 189*-192
    gemmipara 190
    paradoxa 13-14, 213
    putredinis 13-14
Mortierella 181
Mycogloea 311
Mycosphaerella 321, 323-324, 327, 332, 429, 465
    aequatoriensis 428-429
    asperifolii 465
    eugeniae 428
    EUGENICOLA 405, 425*-426, 429
    lithospermi 465
    lythracearum 421
    PULMONARIAE 465*-466
    tassiana
      var. arctica 465
    tournefortiae 465
    vexans 429
    zeae-maydis 332
Mycosyrinx 304, 310
Mycovellosiella 405, 424
    micranthae 420
    peixotoae 423-424
    RUBIDA 424-425*
Myiophagus 94-95
Myrophagus 94
Myrothecium
    roridum 378
Myxophora 155, 163
    amerospora 155
Myzocytium 92, 94
    proliferum 93, 95

Naohidea 311
Nectria
    pseudotrichia 380
Nematostigma 155
    obducens 155
Nematostoma 149, 151-152, 155, 157, 159, 166
    artemisiae 155, 160, 166
    costaricana 166

[Nematostoma]
    GARRYAE 149, 160, 167*
    hoehnelii 166
    occidentale 166
    PARASITICUM 149, 160, 167*
Nematothecium 155-156
    vinosum 155
Neocoleroa 149, 155, 158, 163-164
    ALPIVAGA 149, 164*
    DRYADIS 149, 164*
    FIMBRIATA 149, 160, 163*
    GALLICA 149, 160, 164*
    LICHENICOLA 164*
        ssp. LICHENICOLA 149, 164*
        ssp. BOUTEILLEI 149, 164*
    MOLARIFERA 149, 160, 164*
    sibirica 155, 163-164
Neodimerium 155
    sydowii 155
Neophacidium
    quercus 163
Neosporidesmium
    maestrense 213
Nodulisporium 40
    gregarium 213
Nummularia 39, 41, 48
    cinerea 43, 45
    clypeus
        var. macrospora 49
    gracilenta 49
    grisea 43, 45
    hypophlaea 45
    hypophloea 46, 49
    lamprostoma 49
    maculata 49-50
    microplaca 49
    punctatobrunnea 47, 50
    scutata 49
    viridis 40, 47-48
Numulariola
    hypophlaea 45
    maculata 49
    microplaca 49
    ovata 49

Occultifur 311
Odonticium
    helgae 238
Oligoporus 290, 349
    farinosus 349
    rennyi 349-351
Ontostheca 155
    conglobata 155
Ophiogene 155
    philippinensis 155

Pachnocybe 308
Pachykytospora
    alabamae 285-286, 295-296
    papyracea 285-286, 295-297
Palifer 229, 237
    verecundus 237
    radicis 331
Parasympodiella 366, 369, 372
Parmelia 225
Parodiopsis 155
Passalora 405-406, 408, 412, 414, 416
    ARRABIDAEAE 408*
    CAMPINENSIS 408, 410*-411
    COLUBRINAE 411*-412
    FULIGNIOSA 412*
    syzygii 411
    UBATUBENSIS 412, 414*
    VICOSAE 414*
Patouillardina 155
Peglionia
    verticiclada 210
Peltigera 165
Peniophora
    confusa 238
    verecunda 229, 237
Perenniporia 76
    medulla-panis 285-286, 297-298
Periconia
    byssoides 214
    minutissima 214
Periconiella 40
PERIDIOSPORA 179, 180*-181, 186
    RETICULATA 179, 181-182, 184*, 186
    TATACHIA 179-180, 181*-182, 184, 186
Perisporiopsis 151
Pertusaria 17, 20
  Subg. Monomurata 18
  Sect. Monomuratae 19
    AMNICOLA 17-18*, 22
    ASTERELLA 17, 19*
    BURBURANA 17, 19*-20
    CONIOPHORA 17, 20*, 22
    consanguinea 17, 27
    copelandii 17, 27-28
    damiensis 32
    DORADORENSIS 17, 20*-22
    elliptica 17, 28
    epitheciifera 21
    GONGYLOSPORA 17, 21*
    GOROKORANA 17, 23*, 27
    hermaka 17, 25, 28-29
    howeana 17, 29
    KAGAMUGANA 17, 22-23*, 24, 27
    leioplaca
        var. dispora 17, 32
    leucoplaca 24
    monpittensis 26
    philippina 17, 30
    planaica 21
    pseudococcodes 17, 30-31
    psoromica 17, 31
    puffina 17, 31-32
    pycnothelia 17, 32
    ramulifera 17, 26, 33
    scaberula 31
    sorodes 25

[Pertusaria] subplanaica 17, 33-34
  subradians 30
  SUBSORODES 17, 25*
  velata 30
  vulpina 17, 34
  WAUENSIS 17, 20, 22, 25*-26, 33
  WEBERI 17, 23, 26*
Peyronellaea 323, 331
  glomerata 331
Phaeangium 434
  lefebvrei 434
Phaeocapdinula 156
  paulistae 156
Phaeocapnodinula 156
Phaeodimeriella 149, 151-154, 156-160
  LANGLOISII 149, 160*
  MELIOLICOLA 149, 160*
  occulta 151, 156
  parvula 151, 156, 160
Phaeodimeris 156
Phaeoisaria
  clematidis 214, 379
Phaeoisariopsis 405, 416
  LUHEAE 415*-416
Phaeophragmeriella 155-157
  meliolicola 156
Phaeoramularia 412
  pyrostegiae 412, 416
  rubida 425
Phaeosphaeria 324, 326
Phaeostigme 152, 154, 156-157
  piceae 156
Phanerochaete
  exilis 239
  sanguinea 239
Phellinidium 67
Phellinus
  punctatus 248
Phellorinia 398
  gigantea 394
  herculanea 393, 398
Phialea
  glaucescens 449
Phialophora 323-324, 328-330, 332
Phillipsiella
  purpurea 167
Philonectria 156, 158
  variabilis 156
Phitomyces
  chartarum 218
Phlebia
  coccineofulva 239
  lividina 239
  rufa 239
  subcretacea 239
Phlebiella
  californica 239
  tulasnelloidea 239
  vaga 239
Phleogena 303-304, 308
  faginea 308
Phoma 227, 321, 322-326, 328-329, 331-
  Sect. Heterospora 321, 322-323, 325-326, 328-331
  Sect. MACROSPORA 321, 323, 325, 330, 332*
  Sect. Paraphoma 322-323, 325, 329, 331
  Sect. Peyronellaea 321, 323, 325, 329, 331
  Sect. Phoma 321, 322-323, 328, 330
  Sect. PHYLLOSTICTOIDES 321, 323, 325, 328-329, 331*
  Sect. PILOSA 321, 323, 325, 330, 332*
  Sect. Plenodomus 321, 323, 325, 329-330, 332
  Sect. SCLEROPHOMELLA 321, 323, 325, 328-329, 331*
  betae 333
  complanata 332
  exigua
    var. exigua 331
  glomerata 331
  herbarum 321-323, 330
  heteromorphospora 330
  lingam 332
  radicina 331
  variospora 330
  zeae-maydis 332
Phragmeriella 156, 160
  irenicola 160
  ireninae 156
Phragmocapnias 152
Phragmodimerium 156
  insigne 156
Phyllosticta 326
  maydis 332
Pichia
  acaciae 459
  anomala 459
  farinosa 459
  membranaefaciens 459
  pastoris 459
Pilula 156
  straminea 156
Piricauda 9
  cochinensis 9, 215
  LONGISPORA 7-8, 9*, 11
Piricaudilium 215
  lobatum 215
Pithomyces
  maydicus 218
Plactogene 156
  lindigii 156
Platygloea 311
  housespora 311
Plenodomus 323, 332
  rabenhorstii 332
Pleospora 321, 323-324, 327, 332-333
  betae 333
  delicatula 166
Pleurographium
  simplex 215
Pleurophoma 324-325

Pododimeria 156-157
    gallica 156
Podoscypha 401
    nitidula 401-402
    WARNECKEANA 401, 402*-403
Podosporium
    nilgirense 375, 379-380
Polyporus
    brownei 68
    rennyi 349
    semisupinus 68, 73, 79
    versicutis 76-77
Polyscytalum 366, 369, 372
Poria 359
    chlorina 288
    distorta 73
    inflata 353
    rennyi 350-351
Porostereum
    crassum 239
Porostigme 156
    scheffleri 156
Preussia 326
Pseudocercospora 405, 416, 418, 421-422, 428
    ARTANTHES 416*, 418
    BIXAE 416, 418*, 420
    bixicola 418, 420
    MICRANTHAE 418, 420*
    punicae 421
    sawadae 421
    SPHAERELLAE-EUGENIAE 405, 425*-426, 429
    tibouchinae 418, 422
    ubatubensis 414
    urenae 418, 423
Pseudocyphellaria 37-38
    aurata 37-38
    aurora 37-38
    clathrata 37-38
    intricata 37-38
    kalbii 37-38
Pseudodimerium 157
    meliolicola 160
    meliolicolum 157
Pseudolizonia 157
    baldinii 157
Pseudoperis 157
Pseudoperisporium 157
    erigeronicola 150, 157
Pseudospiropes 366, 368-372
    josserandii 371
    nodosus 371
    obscurus 371
    simplex 371
Pseudotomentella
    flavovirens 246
    fumosa 245-246
    griseopergamacea 246
    griseoveneta 246
    kaniksuensis 246
    molybdea 246

Punctelia 225
Pyrenochaeta 324-325
    parasitica 167
Pythium 92

Queletia 398

Raciborskiomyces 149, 152-153, 157, 159-160, 163, 165-166
    GARRYANUS 149, 160, 165*
    LONGISETOSUS 149, 165*
    PELTIGERICOLA 149, 165*
    polonicus 157, 165
    VOLKARTIANUS 149, 165*
Radulomyces 239
    confluens 239
    fuscus 239
    rickii 239
Rasutoria 158
Relicina 227
Repetobasidiellum
    fusisporum 232
Repetobasidium
    mirificum 240
Rhodocollybia 141
Rhodosporidium 306
    toruloides 308
Rhodotorula
    glutinis 459
    minuta 459
    mucilaginosa 459
Rigidoporus 288, 293
Rustroemia 453
    renispora 451, 453

Saccharomyces
    capsularis 459
    cerevisiae 459
Saccoblastia 303, 305, 308
Schizopora
    flavipora 240, 285-286, 298-299
    paradoxa 236, 285-286, 299-300
Schizostoma 398
Schroeteria 304, 313-314
    delastrina 313-314
    poeltii 313
Schwanniomyces
    occidentalis 459
Sclerochaetella 323
Sclerocystis
    rubiformis 186
Sclerogone 179-181, 187
Sclerophomella 323, 331
    complanata 332
Scytinostroma
    portentosum 240
Septobasidium 311
Septolpidium 94-95
Septoria 85
Sirobasidium 261, 264, 282
    RUBROFUSCUM 261, 262*-265, 282
    sanguineum 262, 264-265

Sistotrema
    brinkmanii 240
    diademiferum 240
    raduloides 240
Sistotremastrum
    niveocremeum 240
Sistotremella
    perpusilla 240
Solosympodiella 366, 369-370, 372
    clavata 370
    cylindrospora 370
    inaequiseptata 370
    palmicola 370
    phyllostachidis 370
    pseudoseptata 370
    queenslandica 370
    rigidentata 370
Somatexis 157
    coccolobis 157
Sorosporium 57, 61
    saponariae 61
Sphacelotheca 62, 312
Sphaeria 264
    asperifolii 465
    corniformis 197
    hypophloea 46
Sporidesmium
    adscendens 14
    leptosporum 13-14
    nopides 380
Sporidiobolus 306
    johnsonii 459
Sporobolomyces
    roseus 459
Sporormia 326
Sporoschisma
    nigroseptatum 216
Stachybotrys
    parvispora 375, 380
Stachylidium
    bicolor 219
Stagonospora 324, 326
Stagonosporopsis 321, 323-325, 328, 330
Steccherinum 69
    albo-fibrillosum 240
    bourdotii 69
    ciliolatum 240
    cremeoalbum 69
    laeticolor 240
    ochraceum 69, 240
    oreophilum 69
    subcrinale 69
    subochraceum 240
Stemphylium
    sphaericum 211
Stephensia 431, 434
    arenivaga 434
    bombycina 431, 434
    BYNUMII 431-432*, 434-435
    peyronelii 434
    shanori 431, 434-435
    sumatrana 435
    complicatum 240
    ostrea 240
    sanguinolentum 376
    warneckeanum 401-402
Stevensula 157
    monensis 157
Stigmatea
    andromedae 162
    plantaginis 162
Stigme 157
    lussoniensis 157
Stilbum 308
Strangulidium
    rennyi 351
Strossmayeria 371-372
    atriseda 371
    basitricha 371
    immarginata 371
    josserandii 371
Subulicystidium
    longispora 240
Subulispora 366, 369-372
    africana 369-370
    argentina 369-370
    britannica 369
    cylindrospora 369-370
    elegantissima 369-370
    gracilis 369-370
    hareae 369
    longirostrata 369-370
    malaysiana 369-370
    minima 369-371
    procurvata 369-370
    rectilineata 369-370
    variabilis 369
Sympodiella 366, 369, 372
SYMPODIOPLANUS 365-366*, 368-372
    CAPENSIS 365-366*, 371

Thanatephorus
    cucmeris 240
Thecaphora 57, 61, 65
    hyalina 61
    seminis-convolvuli 58, 61, 65
Thedgonia 369
Therrya 173-174, 176-177
    EUCALYPTI 173, 174*-175
    fuckelii 174, 176
    gallica 174
    piceae 176
    pini 174, 176
    pseudotsugae 176-177
    tsugae 176-177
Tilletia
    caries 65
    foetida 305
    laevis 305
Tilletiaria
    anomala 312
Tolyposporella 57, 62, 65
    brunkii 58, 65
    chrysopogonis 62

Tolyposporium 57, 61, 65
    junci 58, 61, 65
    restifaciens 57, 59
Tomentella 237, 258
    bryophila 245-246
    chlorina 237
    ellisii 246-247
    ferruginea 247-248
    italica 247-248
    lapidum 256
    mycophila 256
    nitellina 249-250, 253
    ochracea 246
    pilosa 249-250
    sublilacina 251
    subtestacea 251-252
    terrestris 249-250, 252
    testaceogilva 253-254
    umbrinospora 253-254
    violaceofusca 254-255
Tomentellago 229
Tomentellastrum
    alutaceoumbrinum 255-256
    caesiocinereum 256-257
    macrosporum 256
Tomentellina
    fibrosa 257
Tomentellopsis
    pusilla 257-258
Toroa 157, 166
    dimerosporioides 157
Torula
    herbarum 219
        f. quaternella 219
Torulaspora
    delbrueckii 459
Trametes 68
Tranzschelia 51, 55
    arthruii 51
    discolor 51, 55
    HYRCANICA 51, 52*-53, 55
    IRANICA 51-52, 54*-55
    japonica 51
    microcerasi 51, 55
    ornata 51
    pruni-spinosae 51
Trechispora
    farinacea 240
    nivea 240
    stevensonii 240
Tremella 261-262, 266, 276, 278, 282
    aurantia 261, 266-267, 282
    auricularia 262, 268-270, 277, 282-283
    australiensis 266
    brasiliensis 261, 268-272, 282
    dysenterica 270, 272-274, 282-283
    fibulifera 274-276, 278, 282-283
    fimbriata 268, 276-277
    foliacea 268, 276-277, 280-283
    fuciformis 262, 276, 278-279, 282-283
    fusca 262, 264-265
    lutescens
    mesenterica 270
    olens 276
    rubromaculata 274
    spectabilis 261, 266
    wrightii 277, 280-283
Trichaptum
    abietinum 73, 78
Trichia 390
Trichomerium 152
Trichosphaeria
    parasitica 167
Tuber 437
    ANNIAE 437, 438*-439, 441
    californicum 441
    gibbosum 437
    monticola 437, 441
    shearii 437, 441
    sphaerosporum 441
Tubercularia
    lateritia 380, 382
Tubeufia 151
Tubulicrinis
    hamatus 240
Tulostoma 398
Tyromyces 76, 290
    fissiliformis 76
    ptychogaster 351
    rennyi 350-351

Urocystis
    colchici 306
Ustilago 59, 312-314
    hordei 65
    intermedia 313
    nuda 306
Ustilentyloma 62

Vararia
    fibra 353
    tropica 353
Venturia
    cassandrae 162
    fimbriata 163
    longisetosa 165
Vermiculariopsiella 335, 338
    LUDOVICIANA 335, 338*
Vesiculomyces 361-362
    globosporous 362
    moniliformis 362
Virgariella
    oblonga 216
Virgatospora
    echinofibrosa 216-217

Wentiomyces 151-155, 157, 163, 165
    alpivagus 164
    dryadis 164
    fimbriatus 164
    javanicus 157, 163
    lichenicola
        ssp. bouteillei 164
    molarifer 164

Westerdykiella 326
WHALLEYA 39-40, 48*
    MACULATA 39, 49*
    MICROPLACA 39, 41, 48*, 50
Williopsis
    saturnus 459
Winteromyces 150
Wolfiporia
    dilatohypha 353-359

Xenasma
    aculeatum 240
    pulverulentum 240
    rimicola 241
Xenogibbera 157
Xenosporium
    berkeleyi 13-14, 219
Xylaria 195
    aberrans 197
    apiculata 198-200
    arbuscula 199
    corniformis 197-198
        var. corniformis 198
        var. macrospora 196-198
    cubensis 198
    holmbergii 197-198
    hypoxylon 200
    longipes 197-198
    macrospora 198
    MONTAGNEI 195-196*, 198, 201
    PSEUDOAPICULATA 195, 198*, 200-201
    rhopaloides 197
        var. brevipes 197
        var. brunnea 197
        f. brevipes 197
    scruposa 197
    transiens 198
    tuberosa
        f. consociata 197
    violaceo-pannosa 197

Yarrowia
    lipolytica 459
Youngiomyces 180, 187

Zygosaccharomyces
    rouxii 459
Zygosporium
    echinosporum 217
    minus 217
    oscheoides 14, 219

Reviewers, Volume Sixty-four

The Editors express their appreciation to the following individuals who have, prior to acceptance for publication, reviewed one or more of the papers appearing in this volume:

R. J. Bandoni
D. J. S. Barr
M. E. Barr
G. L. Benny
L. M. Carris
E. Descals
J. A. Elix
D. J. Galloway
J. H. Ginns
R. D. Goos
N. Hallenberg
D. M. Henderson
S. J. Hughes
D. Langsam
T. Læssøe
M. J. Larsen
N. Lundqvist
P. M. McCarthy
D. J. McLaughlin
A. Montemartini Corte
D. E. Padgett
D. N. Pegler
L. Petrini
E. Punithalingam
S. Redhead
P. Roberts
C. T. Rogerson
L. Ryvarden
H. Scholz
J. W. Taylor
K. Wells

Publication Date Volume Sixty-three

MYCOTAXON for June-August 1997, volume 63: 1-516
was issued on July 17, 1997.

MYCOTAXON is published quarterly during the periods of January–March, April–June, July–September, and October–December by Mycotaxon, Ltd., 316 Richard Pl., Ithaca, NY 14850. Application to mail at periodicals postage rates is pending at Ithaca, NY, and at additional mailing offices. Subscription rates: In U.S. and possessions, one year, $260.00; reduced rate for personal subscribers, one year, $120.00. Foreign subscriptions, one year, $268 by surface mail, $280 by ISAL air mail; reduced rate for personal subscribers, $128 by surface mail, $148 by ISAL air mail.

POSTMASTER: Send address changes to Mycotaxon, Ltd., P.O. Box 264, Ithaca, NY 14851-0264.

EDITORS OF MYCOTAXON

Jean Boise Cargill, *Editor-in-Chief*
P. O. Box 391887
678 Mass. Ave. Suite 501
Cambridge, MA 02139-0019, U.S.A.

ASSOCIATE EDITORS

Karen D. Gettelman
Index Editor
St. Louis, MO
USA

E. H. C. McKenzie
Book Review Editor
Landcare Research
Private Bag 92170
Auckland, New Zealand

G. L. Hennebert
French Language Editor
32 Rue de l'Elevage
B-1340 Ottignies-LLN
Belgium

Pavel Lizoň
Asst. to the Ed.in-Chief
Plant Pathology Herbarium,
Cornell Univ.
Ithaca, NY USA

MYCOTAXON is a quarterly peer-reviewed journal devoted to all phases of mycological taxonomy and nomenclature. All articles are reviewed by specialists prior to acceptance. Publication is open to all persons. Papers may be in English or in French. Summaries in those or any additional languages desired by the authors are given for longer articles. Printing is on high quality, acid-free book paper. Authors prepare their own *camera-ready* copy after having received critical comments from pre-submission reviewers. *Instructions to Authors* appeared in MYCOTAXON 50: 493-497. 1994. A copy of these will be sent upon request to the Editor-in-Chief, and are posted on our website, <www.mycotaxon.com>.

SUBSCRIPTION INFORMATION

Each volume, beginning with volume 3, contains at least 512 pages. Beginning in 1997 all subscriptions are on an annual basis, with four quarterly volumes each year. Personal subscriptions are available at a substantially reduced rate for individuals who agree not to deposit their copies in another library than their personal one within 3 years of receipt. Address all orders to the Mycotaxon Order Department, not to the Editors. Prices for subscriptions for 1988 (volumes 66–69) are:

	USA	Foreign (surface)	Foreign (air)
REGULAR (multiuser)	$260	$268	$280
PERSONAL (individual)	$120	$128	$148

(Most back volumes—except vols. 1, 34(2), 43, and 46—are still available at $30 each by surface, $45 each by air; all volumes are available in microform.)

Place subscriptions through the ORDER DEPT., MYCOTAXON, LTD., P. O. BOX 264, ITHACA, NY 14851-0264, USA, or through your agent. MYCOTAXON may also be obtained on a journal exchange basis. This may be arranged with journals, institutions, or individuals who have difficulty in obtaining foreign currency.

AVAILABILITY IN MICROFORM, TEAR SHEET, & PHOTOCOPY

MYCOTAXON is also available in microfiche and in microfilm from University Microfilms, 300 North Zeeb Road, Ann Arbor, MI 48106, USA, or 30-32 Mortimer Street, London W1N 7RA, Great Britain, from whom prices may be obtained. Tear sheets or photocopies of individual articles may be obtained through *The Genuine Article*™, I. S. I., 3501 Market Street, Philadelphia, PA 19104, USA.

TWENTY-VOLUME CUMULATIVE INDICES, 1974-1984, 1984-1991, 1991-1996

MYCOTAXON CUMULATIVE INDEX FOR VOLUMES I–XX (1974-1984) by Richard P. Korf & Susan C. Gruff (ISBN 0-9308450-00-5) is available at $17.50 postpaid; MYCOTAXON CUMULATIVE INDEX FOR VOLUMES XXI–XL (1984-1991) by Richard P. Korf &Susan C. Gruff is available at $30.00 postpaid; MYCOTAXON CUMULATIVE INDEX FOR VOLUMES XLI-LX (1991-1996) by Karen D. Gettelman, Richard P. Korf, Susan C. Gruff, & Ian F. Korf is in preparation.

CUMULATIVE INDEX, VOLUMES 61 (1997) & FOLLOWING

A cumulative taxon index for volumes 61-ff is now posted on our website, <www.mycotaxon.com>. We plan also to provide a cumulative author index for those volumes at this site.

CONTACTING MYCOTAXON'S EDITOR-IN-CHIEF BY E-MAIL OR FAX

To reach the Editor-in-Chief regarding manuscripts, you may E-Mail to jbc@world.std.com or you may FAX to 617) 661-0802.

CONTACTING MYCOTAXON'S ORDER DEPARTMENT BY E-MAIL OR FAX

To reach the Order Department for information. or placing orders, you may E-Mail to rkorf@innet.com or you may FAX to Mycotaxon, Ltd. at (607) 273-4357.

VISIT MYCOTAXON ON THE WORD WIDE WEB AT www.mycotaxon.com